

# Patient Safety, Spring 2019 Final CDP Report

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## **Executive Summary**

Patient safety-related events occur across healthcare settings and include a variety of preventable and potentially preventable incidents such as pressure ulcers, falls, and healthcare associated infections. Medical errors are a major cause of patient safety events, and they are estimated to cause hundreds of thousands of preventable deaths each year in the United States,<sup>1</sup> making them the third leading cause of death.<sup>2</sup> Quality measurement and improvement efforts have helped to drive substantial reductions in patient safety-related events, particularly in hospitals, such as reductions in central line related blood stream infections and catheter-associated urinary tract infections. Yet, despite these improvements in safety, opportunities still exist to reduce harm and promote more affordable, effective, and equitable care across settings.

The Patient Safety Standing Committee oversees the NQF Patient Safety portfolio and assesses both novel and existing performance measures for endorsement using NQF's measure evaluation criteria. This review cycle included measures related to the following key safety topics: electronic clinical quality measures (eCQMs) that measure harmful events within hospitals, hospital-acquired infections, mortality following hospitalization, nurses' staffing and skill mix, and antibiotic use. Additionally, the Standing Committee provides feedback on gaps and priorities related to patient safety and contributes to the advancement of measurement in this area.

The Committee identified several overarching themes in this review cycle, including unintended consequences from measure use, ensuring maintenance measures are in use, the movement toward eCQMs, and the meaning of public reporting.

For this project, the Standing Committee evaluated five newly submitted measures and six measures undergoing maintenance review against NQF's standard evaluation criteria. The Committee endorsed nine measures, did not endorse one measure, and one measure was withdrawn by the developer.

The endorsed measures are:

- 0138 National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure
- 0139 National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure
- 0204 Skill mix (Registered Nurse [RN], Licensed Vocational/Practical Nurse [LVN/LPN], unlicensed assistive personnel [UAP], and contract)
- 0205 Nursing Hours per Patient Day
- 2720 National Healthcare Safety Network (NHSN) Antimicrobial Use Measure
- 2726 Prevention of Central Venous Catheter (CVC)-Related Bloodstream Infections
- 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure (CMS/Yale-CORE)
- 3503e Hospital Harm Severe Hypoglycemia
- 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The Committee did not endorse the following measure:

• 3501e Hospital Harm – Opioid-Related Adverse Events

The developer withdrew the following measure from consideration:

• 3498e Hospital Harm – Pressure Injury

Brief summaries of the measures are included in the body of the report; detailed summaries of the Committee's discussion and ratings of the criteria for each measure are in <u>Appendix A</u>.

### Introduction

Addressing patient safety is central to advancing healthcare quality and improving healthcare delivery. For almost 20 years, the National Quality Forum (NQF) has led initiatives to measure patient safety performance, promote safe practices, and identify and reduce serious reportable events (SREs) and hospital-acquired conditions (HACs). These efforts have also involved expanding the number and use of high-quality patient safety measures across settings as well as promoting alignment of existing measures.

Measures in the Patient Safety portfolio target various patient safety events and practices across healthcare settings. In this review cycle, measures span several types of healthcare settings and are connected to important areas in patient safety, including electronic clinical quality measures (eCQMs) that assess harmful events within hospitals, hospital-acquired infections, mortality following hospitalization, nurses' practice environment, and antibiotic use.

Patient safety measurement and quality improvement efforts represent one of the most successful applications of quality measurement and have had a significant impact on patient-safety events in U.S. hospitals. For example, results from the Agency for Healthcare Research and Quality (AHRQ) National Scorecard on Hospital-Acquired Conditions (HACs) Updated Baseline Rates and Preliminary Results indicate that from 2014 to 2017 HACs fell by approximately 13 percent. From 2015 through 2017 national efforts targeting these conditions helped prevent 20,500 deaths and saved \$7.7 billion.<sup>3</sup> This cycle involved a reassessment of HACs as an outcome measure as well as the prevention of HACs, specifically central line associated blood stream infections and catheter-associated urinary tract infections. In addition, other measures addressed measuring the overuse of antibiotics within hospitals, as well as in-hospital mortality.

Additionally, with the increasing ubiquity of electronic health records (EHRs), there has been increased interest in electronic clinical quality measures (eCQMs) that can be automatically extracted from EHRs. In this cycle, the Patient Safety Standing Committee reviewed three eCQMs related to hypoglycemia, pressure injuries, and naloxone use for opioid overdose. Many see eCQMs as the future of quality measurement and a key advancement in measurement science. Over the coming years, eCQMs will become increasingly important as they reduce the burden of abstraction and can rely on more detailed clinical data.

Finally, a key element of this cycle was a maintenance endorsement evaluation of performance measures addressing nursing staffing. The nursing staffing measures were developed more than a decade ago. Staffing measures are vital because ensuring a healthy workplace environment is a fundamental factor in promoting safe and high-quality care. A recent study found that between 2005 and 2016, 21 percent of hospitals made substantial gains in improving nurses' working environment. By comparison, 7 percent of hospital working environments worsened. Among hospitals where the care environment improved for nurses, improvements in performance on patient- and nurse-reported patient safety indicators followed. Improvements include an 11 percent increase in the percent of patients rating their hospital favorably and a 15 percent increase in nurses reporting excellent quality of care and giving the hospital a favorable patient safety grade.<sup>4</sup> Another study found that most new

nurses work 12-hour shifts and approximately half work overtime, trends that have been fairly stable.<sup>5</sup> This occurs despite an established link between overtime and poor patient outcomes (e.g., medical errors, healthcare-associated infections [HAIs], and nurses' well-being), making measurement of the nursing working environment an area in need of continued measurement and improvement. <sup>6–8</sup>

## NQF Portfolio of Performance Measures for Patient Safety Conditions

The Patient Safety Standing Committee (<u>Appendix C</u>) oversees NQF's portfolio of Patient Safety measures (<u>Appendix B</u>). This portfolio contains 62 measures: 17 process measures, 37 outcome measures, two intermediate outcome measures, three structure measures, and three composite measures (see table below).

	Process	Outcome	Intermediate Outcome	Structure	Composite	Total
Medication Safety	8	1	_	_	_	9
Healthcare-Associated Infections	2	7	-	-	-	9
Perioperative Safety	-	7	_	_	_	7
Falls	1	5	_	_	_	6
Mortality	_	7	_	_	1	8
Venous Thromboembolism	-	1	—	_	—	1
Pressure Ulcers	-	3	_	_	_	3
Workforce	-	_	_	3	_	3
Radiation Safety	1	_	1	_	_	2
Other	5	6	1	_	2	14
Total	17	37	2	3	3	62

#### **Table 1. NQF Patient Safety Portfolio of Measures**

Additional measures related to patient safety are assigned to other projects. These include various diabetes assessment and screening measures (Prevention and Population Health/Behavioral Health and Substance Use projects), primary care and chronic illness measures (Primary Care and Chronic Illness project), ACEI/ARB medication measures (Cardiovascular project), complications measures (Prevention and Population Health/Surgery projects), and cost and efficiency measures (Cost and Efficiency project).

### **Patient Safety Measure Evaluation**

At the in-person meeting on June 17, 2019 at the NQF offices in Washington, DC and at two additional web meetings on June 24, 2019 and July 2, 2019, the Patient Safety Standing Committee evaluated five new measures and six measures undergoing maintenance review against NQF's <u>standard measure</u> <u>evaluation criteria</u>.

	Maintenance	New	Total
Measures under consideration	6	5	11
Measures endorsed	6	3	9
Measures not endorsed	0	1	1
Measures withdrawn from consideration	0	1	1
Reasons for not recommending	Importance –N/A Scientific Acceptability – N/A Use – N/A Overall Suitability – N/A Competing Measure – N/A	Importance – 1 Scientific Acceptability – 0 Overall Suitability – 0 Competing Measure – 0	

#### **Table 2. Patient Safety Measure Evaluation Summary**

### **Comments Received Prior to Committee Evaluation**

NQF solicits comments on endorsed measures on an ongoing basis through the <u>Quality Positioning</u> <u>System (QPS)</u>. In addition, NQF solicits comments for a continuous 16-week period during each evaluation cycle via an online tool located on the project webpage. For this evaluation cycle, the commenting period opened on April 24, 2019 and closed on August 26, 2019. As of June 5, 34 comments had been submitted and were shared with the Committee prior to the measure evaluation meetings (Appendix F). Thirty-one comments on measure 0138 requested that the Standing Committee carefully examine the risks and benefits of the measure, particularly for persons with spinal cord injury. Two commenters for measure 3498e had concerns related to the 24-hour timeframe from admission to declare a hospital-acquired pressure injury, the reliability and validity, and a lack of clear guidance as to where in the electronic medical record the pressure injury documentation will be extracted. One commenter was supportive of measure 3498e over the existing PSI 03 measure.

All submitted comments were provided to the Committee prior to their initial deliberations during the June 17 in-person meeting and post-measure evaluation meetings on June 26 and July 2, 2019.

### **Comments Received After Committee Evaluation**

The continuous 16-week public commenting period with NQF member support closed on August 26, 2019. Following the Committee's evaluation of the measures under consideration, NQF received 19 comments from four organizations (all member organizations) and individuals pertaining to the draft report and to the measures under consideration. All comments for each measure under consideration have been summarized in <u>Appendix A</u>.

Throughout the 16-week continuous public commenting period, NQF members had the opportunity to express their support ("support" or "do not support") for each measure submitted for endorsement consideration to inform the Committee's recommendations. Three NQF members provided their expressions of support/nonsupport. One of the eleven measures under consideration (0138) received

support, while eight measures (0138, 0139, 2720, 3498e, 3501e, 3502, 3503e, and 3504) received an expression of "do not support."

#### **Overarching Issues**

During the Standing Committee's discussion of the measures, several overarching issues emerged that were factored into the Committee's ratings and recommendations for multiple measures and are not repeated in detail with each individual measure.

#### The Importance of Unintended Consequences

During the Committee meeting, there was considerable discussion about the potential for unintended consequences of the CAUTI measure in a specific population: spinal cord injury patients. While there was agreement that the CAUTI measure is a well-designed measure in general, and in broad use, the measure has the potential to cause harm in this particular subpopulation as it may cause providers to pull catheters and rely on intermittent catheterization in the hospital. Pulling the catheter in this population was described by advocates of spinal cord injury patients to cause autonomic dysreflexia, which can potentially cause serious complications. Given these concerns, the measure was initially consensus not reached on the validity criterion. After subsequent discussion at the post-comment meeting, the Committee recommended the measure for endorsement.

#### Ensuring Maintenance Measures Are in Use

As the quality measurement enterprise has matured, scrutiny of maintenance measures has increased to ensure that they are in use and/or planned to be implemented in public programs.

#### Focus on Feasibility of Novel eCQMs

There were several new eCQMs that were reviewed during the in-person meeting. This was the first time this Committee had seen eCQMs, and Committee members focused heavily on the testing component. Several of the measures had issues, not with how they were structured but whether the data were being consistently documented in structured fields within all the EHRs tested. During the process of testing, many of these issues were remedied, but it does illustrate potential feasibility issues with eCQMs that require examination by future committees.

#### Transparency of Measure Results

The Committee discussed the meaning of "public reporting." Members emphasized that, ideally, more measure results would be available to the public so individuals can better understand the quality of care being provided and use this information to inform decisions. However, the Committee recognized that developers often do not have control over how measures are used and to whom the results are available.

#### Summary of Measure Evaluation

The following brief summaries of the measure evaluation highlight the major issues that the Committee considered. Details of the Committee's discussion and ratings of the criteria for each measure are included in <u>Appendix A</u>.

#### 3501e Hospital Harm – Opioid-Related Adverse Events (CMS/IMPAQ International): Not Endorsed

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients age 18 years and older who suffer the harm of receiving an excess of hospital-administered opioids, defined as receiving a narcotic antagonist (naloxone). In the first 24 hours of the hospitalization, a hospital-administered opioid must be documented prior to receiving naloxone to be considered part of the numerator. **Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Electronic Health Records

This measure did not pass the Performance Gap criterion—a must-pass criterion. The Committee raised several concerns with this measure. First was whether naloxone use is a good indicator of quality. There was concern that naloxone can be used as empiric therapy in patients with changed sensorium, so its use does not necessarily indicate that there was an opioid overdose. In addition, there were concerns that sometimes naloxone may be used to reverse opioids as part of a plan of care and that the measure may cause providers to be more reluctant to give naloxone when it is needed. There were also concerns about how the measure was specified—as a proportion of hospitalized patients versus hospitalized patients who received narcotics—and how the propensity to use narcotics by a hospital might change performance rates. There were also issues in the measure testing because there are various places in the EHR where narcotics may be documented (e.g., in the medication administration record (MAR) or within procedure notes). In addition, there were concerns that the actual rate of occurrence was relatively low in measure testing and that the measure as specified did not suggest a large enough gap to justify measurement. For these reasons, this measure did not pass performance gap.

#### 0138 National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure (Centers for Disease Control and Prevention): Endorsed

**Description**: Standardized Infection Ratio (SIR) of healthcare-associated, catheter-associated urinary tract infections (UTI) will be calculated among patients in bedded inpatient care locations, except level II or level III neonatal intensive care units (NICU). This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavior health hospitals. **Measure Type**: Outcome; **Level of Analysis**: Facility, Other, Population : Regional and State; **Setting of Care**: Inpatient/Hospital, Other, Post-Acute Care; **Data Source**: Electronic Health Data, Electronic Health Records, Other, Paper Medical Records

The Standing Committee initially did not vote on the overall suitability for endorsement at the June measure evaluation in-person meeting because the Committee did not reach consensus on validity—a must-pass criterion. The Committee agreed that there are preventive activities that can reduce the incidence of CAUTI and that there is a performance gap warranting measurement. Committee members suggested that for future endorsement reviews, the developer should analyze and provide data related to performance across different types of institutions (e.g., rehabilitation, acute care, long-term care, etc.). Data element validity testing was conducted, which NQF also accepts as a demonstration of data element reliability. The Scientific Methods Panel evaluated this measure for scientific acceptability and found it to meet NQF's standards for reliability and validity. The Patient Safety Standing Committee discussed the definition of UTIs and the timeframe for determining whether or not a CAUTI is present

but focused its discussion largely on the issue of appropriate exclusions, particularly for spinal cord injury (SCI) patients.

Representatives of the SCI physician community submitted comments and/or attended the Committee meeting in person to voice their concerns about the measure. These commenters suggested that the measure could be causing unintended adverse consequences by encouraging bladder management practices that are inconsistent with appropriate SCI care and have led to harm for SCI patients.

Representatives of the developer organization (CDC) maintained that there was not enough rigorous evidence supporting exclusion of SCI patients, adding that SCI patients are at high risk for CAUTI and should not be removed from the measure. Committee members expressed their desire to find a resolution to this issue, noting their general support for the measure and their appreciation of the need for evidence to support exclusions, while also acknowledging that the SCI community had brought forth compelling information suggesting that harm to SCI patients could be an unintended consequence of this measure. The Committee voted to pass the measure on the Reliability criterion, but initially consensus was not reached on the Validity criterion. The Committee continued on to approve the measure with respect to Feasibility and Use and Usability but did not initially vote on overall suitability for endorsement. During the September 18 post-comment meeting, the Committee discussed and revoted on the validity criterion. The Committee passed the measure on the validity criterion and recommended it for continued NQF endorsement.

## 0139 National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure (Centers for Disease Control and Prevention): Endorsed

**Description**: Standardized Infection Ratio (SIR) and Adjusted Ranking Metric (ARM) of healthcareassociated, central line-associated bloodstream infections (CLABSI) will be calculated among patients in bedded inpatient care locations. This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavioral health hospitals. **Measure Type**: Outcome; **Level of Analysis**: Facility, Population : Regional and State; **Setting of Care**: Inpatient/Hospital, Other, Post-Acute Care; **Data Source**: Electronic Health Data, Electronic Health Records, Other, Paper Medical Records

The Standing Committee recommended this measure for endorsement. The Committee agreed that there are preventive activities that can reduce the incidence of CLABSI and that there is a performance gap warranting measurement. The Committee discussed performance gaps on this measure with respect to variation across ethnic groups, rural vs. urban areas, hospital size, and other factors. Committee members discussed the relationship between "catheter days" and infections, noting that CLABSI risk likely increases the longer a line is left in. The developer noted that the CDC is exploring ways of incorporating this and other factors into measurement calculations. This measure was reviewed against the Scientific Acceptability criteria by NQF's Scientific Methods Panel (SMP); the SMP judged it to have met NQF's standards for reliability and validity. The Patient Safety Standing Committee accepted the SMP's ratings. Committee members agreed that this measure meets the Feasibility and Use and Usability criteria, noting that it is used in federal payment and public reporting programs. Committee members did raise caution about potential gaming of the measure, suggesting that the developer should be watchful for these issues and find ways of addressing them.

#### NATIONAL QUALITY FORUM

# 0204 Skill mix (Registered Nurse [RN], Licensed Vocational/Practical Nurse [LVN/LPN], unlicensed assistive personnel [UAP], and contract) (American Nurses Association): Endorsed

**Description**: NSC-12.1 - Percentage of total productive nursing hours worked by RN (employee and contract) with direct patient care responsibilities by hospital unit. NSC-12.2 - Percentage of total productive nursing hours worked by LPN/LVN (employee and contract) with direct patient care responsibilities by hospital unit. NSC-12.3 - Percentage of total productive nursing hours worked by UAP (employee and contract) with direct patient care responsibilities by hospital unit. NSC-12.3 - Percentage of total productive nursing hours worked by UAP (employee and contract) with direct patient care responsibilities by hospital unit. NSC-12.4 - Percentage of total productive nursing hours worked by contract or agency staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities by hospital unit. Note that the skill mix of the nursing staff (NSC-12.1, NSC-12.2, and NSC-12.3) represent the proportions of total productive nursing hours by each type of nursing staff (RN, LPN/LVN, and UAP); NSC-12.4 is a separate rate. Measure focus is structure of care quality in acute care hospital units. **Measure Type**: Structure; **Level of Analysis**: Facility, Other; **Setting of Care**: Inpatient/Hospital; **Data Source**: Management Data, Other

The Standing Committee recommended the measure for continued endorsement. The Committee agreed that this structure measure is important as it assesses the percentage of total productive nursing hours (employee and contract) with direct patient care responsibilities by hospital unit. The Committee agreed that the evidence remains strong and did not have further discussion. Initially, the Committee had some concern regarding the data presented for performance gap for the various skill mixes in various hospital settings; however, the developer was able to provide tables with differences at the unit level type as well as differences in hospital types. The developer also provided an evidence table linking skill mix to outcomes. The developer noted literature which indicated that even an increase of 1 hour of RN time impacted patient outcomes in hospitals.

The Committee had no concerns on the reliability and validity testing of the measure. Regarding feasibility, Committee members noted significant education done to promote appropriate data collection of nursing care hours in the National Database of Nursing Quality Indicators (NDNQI) database and that nursing as whole is highly invested in the NDNQI database.

Related to use and usability, a few Committee members noted it would be helpful to have a consumerbased report for hospitals below the mean to share skill-mix information with consumers. One Committee member would like to see more than four states using the measure and also more adoption by rural hospitals. The developer noted that this measure is being considered for CMS reporting at the national level, and the conversation has been ongoing. The Committee did lose quorum for voting on the use, usability, and overall endorsement criteria and submitted their vote via SurveyMonkey following the June 24 post-meeting call.

#### 0205 Nursing Hours per Patient Day (American Nurses Association): Endorsed

**Description**: NSC-13.1 (RN hours per patient day) – The number of productive hours worked by RNs with direct patient care responsibilities per patient day for each in-patient unit in a calendar month. NSC-13.2 (Total nursing care hours per patient day) – The number of productive hours worked by nursing staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities per patient day for each in-patient unit in a calendar month. Measure focus is structure of care quality in acute care hospital units. **Measure** 

**Type**: Structure; **Level of Analysis**: Facility, Other; **Setting of Care**: Inpatient/Hospital; **Data Source**: Management Data, Other

The Standing Committee recommended the measure for continued endorsement. The Committee agreed that this structure measure is important as it assesses the number of productive hours worked by RNs with direct patient care responsibilities for each inpatient unit in a calendar month in acute care hospital units. The Committee agreed that a performance gap continues to exist across and within units.

This measure (0205) is linked to 0204 in that 0205 is the denominator for measure 0204. The Committee discussed whether both measures 0204 and 0205 were needed and brought up the potential of creating one measure. The developer noted that the measure elements are completely harmonized. The developer noted that both measures help inform nurse staffing, and there is no additional data collection burden by having both measures.

The Committee had no concerns on the reliability of the measure. For validity testing, the developer did convergent validity testing and compared nursing care hours in the NDNQI database with staffing levels reported by RNs in each unit from the RN survey. At the hospital level, there were lower correlation coefficients. However, the Committee was comfortable with the high correlation coefficients at the unit level and believed that the unit level was more pertinent to the validity of the measure.

Regarding feasibility, the developer noted that most hospitals have an electronic staffing system or payroll to pull the data, and very few are working off a paper record. For use and usability, the developer noted that this measure is being considered for CMS' inpatient quality reporting program at the national level. The Committee did not have a quorum for voting on the measure and submitted their votes via SurveyMonkey following the July 2 post-meeting call.

# 2720 National Healthcare Safety Network (NHSN) Antimicrobial Use Measure (Centers for Disease Control and Prevention): Endorsed

Description: This measure assesses antimicrobial use in hospitals based on medication administration data that hospitals collect electronically at the point of care and report via electronic file submissions to CDC's National Healthcare Safety Network (NHSN). The antimicrobial use data that are in scope for this measure are antibacterial agents administered to adult and pediatric patients in a specified set of ward and intensive care unit locations: medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and stepdown unit (adult only). The measure compares antimicrobial use that the hospitals report with antimicrobial use that is predicted on the basis of nationally aggregated data. The measure is comprised of a discrete set of ratios, Standardized Antimicrobial Administration Ratios (SAARs), each of which summarizes observed-to-predicted antimicrobial use for one of 40 antimicrobial agent-patient care location combinations. The SAARs are designed to serve as high value targets or high level indicators for antimicrobial stewardship programs (ASPs). SAAR values that are outliers are intended to prompt analysis of possible overuse, underuse, or inappropriate use of antimicrobials, subsequent actions aimed at improving the quality of antimicrobial prescribing, and impact evaluations of ASP interventions. Measure Type: Process; Level of Analysis: Facility; Setting of Care: Inpatient/Hospital; Data Source: Paper Medical Records, Registry Data

The Standing Committee recommended the measure for continued endorsement. The Committee agreed that the measure is important to measure based on the national priority to fight antibiotic overuse and the overabundance of antimicrobial prescribing, which leads to antibiotic resistance and fewer options for treating several infections. The measure looks at different units within a facility for both adult and pediatric populations. The Committee discussed that SAAR values that are outliers prompt analysis of possible overuse, underuse, or inappropriate use, but there is no perfect way to determine the "right" amount of antibiotic use. The Committee agreed that the evidence presented demonstrates a strong link between antimicrobial stewardship and better patient outcomes, including a decrease in C. difficile rates. There was some question as to the link between the measure and improved antibiotic and resistance rates. The developer added that more than 1,200 hospitals are now reporting data (approximately a five-fold increase since first endorsed) and able to use results for stewardship purposes. The Committee accepted the reliability and validity testing presented. There was discussion that data used to build the model will always be behind the current state of antimicrobial prescribing. Regarding use, the measure is not proposed for public reporting or payment at this time, but is being used to gauge stewardship intervention. Overall, the Committee believed that although this measure is not ready for accountability, the measure is important as it serves as a marker of potential inappropriate use to drive stewardship. The Committee agreed that broad use provides data needed to refine predictive models so that future versions of the measured can accurately distinguish quality differences across facilities.

## 2726 Prevention of Central Venous Catheter (CVC)-Related Bloodstream Infections (American Society of Anesthesiologists): Endorsed

**Description**: Percentage of patients, regardless of age, who undergo central venous catheter (CVC) insertion for whom CVC was inserted with all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques followed; **Measure Type**: Process; **Level of Analysis**: Clinician : Group/Practice, Clinician : Individual; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

The Standing Committee recommended the measure for continued endorsement. The evidence was unchanged from the past review and included various CDC recommendation statements as well as studies showing the link between maximal sterile barrier technique and catheter-related bloodstream infections. The Committee discussed if the measure had potentially topped out and if there is still a performance gap; however, they acknowledged that although mean performance rates have increased, the standard deviation indicates there is still performance variability. The Committee accepted the previous score-level reliability testing, which showed reliability scores >0.9, and updated validity testing that compared average reporting rates to CLABSI SIRs over the same time period. In the future, the Committee would like to see more specificity in the analysis of the measure and the outcome of infections, as well as data regarding opt-outs and percentage of lines placed in the U.S. versus those being captured in the registry. Regarding feasibility, the Committee agreed the data are captured through chart review/registry reporting. The measure is used in Merit-based Incentive Payment System (MIPS) and for external benchmarking in the National Anesthesia Clinical Outcomes Registry. The Committee discussed the meaning of public reporting and suggested that the developer should aim to increase transparency of performance to the public.

#### 3498e Hospital Harm – Pressure Injury (CMS/IMPAQ International): Withdrawn from consideration

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients ages 18 years and older who develop a new stage 2, stage 3, stage 4 pressure injury, deep tissue pressure injury, or unstageable pressure injury during hospitalization. **Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Electronic Health Records

The Standing Committee recommended the measure for NQF endorsement at the measure evaluation in-person meeting. However, following the September 18 Committee Post-Comment call, the developer for new measure #3498e Hospital Harm – Pressure Injury notified NQF that they are withdrawing the measure for consideration due to substantive anticipated changes. The measure will not move forward in the endorsement process at this time. Below is a summary of discussion on the measure by the Committee for future reference.

Despite concerns with the feasibility across multiple EHRs, the Committee believed overall that this is a good outcome measure for quality of care, and that it is reliable and valid as specified by the developer. During the Standing Committee meeting, there was discussion that while there were several pressure ulcer measures in the NQF portfolio, this was the first submitted as an eCQM. This measure applies to new stage 2, 3, and 4 pressure ulcers that develop during a hospitalization. The Committee agreed that there was one or more healthcare activities that can be performed to reduce the incidence of pressure ulcers. This measure was evaluated by the NQF Scientific Methods Panel; however, the Committee chose to vote on the individual elements of reliability and validity, and there were no major concerns, but there was some discussion about the ability to extract this information within structured fields as well as discussion on testing across multiple EHR vendors. Notably, the developer stated that this had been tested in three separate EHR vendors at beta sites.

The Committee discussed some challenges in the feasibility testing of the eMeasure, particularly the variability in where the measure information was documented in structured fields in one of the EHRs. As a result of this discussion, the Committee had some concerns about feasibility, particularly integrating this measure across multiple EHRs that may not have structured fields to capture pressure ulcer data in a standardized way. Regarding usability, the developer stated that the MAP had recommended inclusion in an accountability program pending feedback from the Committee. Therefore, there were no concerns about usability.

## 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure (CMS/Yale-CORE): Endorsed

**Description**: The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94. Please note that in parallel with the hybrid hospital-wide mortality (HWM) measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently

endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e). Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

- Dataset used for development, some testing (see below for differences), and measure results:
  - a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
  - b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

Measure Type: Outcome; Level of Analysis: Facility; Setting of Care: Inpatient/Hospital, Other; Data Source: Claims, Electronic Health Records, Other

The Standing Committee recommended the measure for NQF endorsement. This is a new measure developed in sequence with measure 3504 (starting with measure 3504). Many of the submission sections are identical to those submitted for measure 3504; therefore, the Committee focused their conversation on key differences between the two measures. This measure is aligned with measure 3504 but includes 10 additional risk adjusters captured from EHR data. This measure expands the target age

to 50 to 94 years from the 65 to 94 years range used in 3504. The measure was tested in a smaller set of 21 hospitals in one integrated delivery system. The developer noted that it performed face validity for the hybrid measure specifically and tested the data element validity of the EHR elements. The developer stated that they tested the claims-based measure extensively and has no reason to believe this measure would be less valid. The developer performed reliability testing for the hybrid measure (ICC=0.78). There was conversation about missing lab values and how they are handled. The Committee suggested that the developer further examine the completeness of lab data when the measure is used more broadly. The Committee generally agreed that the 21 data points from claims and 10 clinical data elements are available in standardized fields and feasible. The Committee acknowledges the plan for the new measure to be considered in the future for the Inpatient Quality Reporting Program.

#### 3503e Hospital Harm – Severe Hypoglycemia (CMS/IMPAQ International): Endorsed

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients aged 18 years and older who received at least one antihyperglycemic medication during their hospitalization, and who suffered a severe hypoglycemic event (blood glucose less than 40 mg/dL) within 24 hours of the administration of an antihyperglycemic agent.; **Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Electronic Health Records

The Standing Committee recommended the measure for NQF endorsement. During the Committee's discussion, there was support that this measure represents a good assessment of quality of care, as it was seen as a preventable patient safety event. However, some were concerned that the measure does not apply to pediatric populations and applies only to adults 18 and older. The Committee was comfortable that there was a sufficient performance gap across hospitals. The Committee voted to accept the NQF Scientific Methods Panel decision on Scientific Acceptability, which was to pass the measure. The Committee also discussed this eCQM's feasibility, which was testing in two separate EHRs, and had few concerns. There were Measure Applications Partnership (MAP) recommendations to include this measure in public accountability programs through CMS; therefore, the Committee passed the measure on usability.

# 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure (CMS/Yale-CORE): Endorsed

**Description**: The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94. Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide

readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

- 1. Dataset used for development, some testing (see below for differences), and measure results:
  - a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
  - b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

**Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Claims, Enrollment Data, Other

The Standing Committee recommended the measure for NQF endorsement. This is a new measure developed in sequence with measure 3502. The measure divides patients into specialty divisions as well as by the presence or absence of significant surgical procedures in order to develop risk-adjustment models for each of the 15 subdivisions of the overall cohort. The model calculates the standardized mortality (risk) ratio for each of those divisions and rolls that into the overall risk standardized hospital-wide mortality rate. The developer explained that 3504 and 3502 are aligned besides the addition of validated EHR risk variables to the hybrid measure to enhance claims-only risk adjustment. The Committee agreed that there are evidence-based strategies to decrease risk of hospital mortality and that there is a gap in mortality scores based on the range of mortality scores presented: 3.95 percent to 8.70 percent. The Committee agreed with the SMP's passing ratings of reliability and validity. At least

one member had some concern about this attribution approach and quality signal (e.g., if the measure is able to appropriately attribute the impact of hospital quality care versus patient-related factors). The developer responded that the hospital-level effect is evident in the distribution rates across hospitals, and they also performed analysis to understand the influence of hospital versus patient factors. The Committee agreed that the measure is feasible based on the use of claims data. There is a plan for the measure to be used in the Hospital Inpatient Quality Reporting Program.

### Measures Withdrawn from Consideration

One measure previously endorsed by NQF has not been re-submitted for maintenance of endorsement. Endorsement for this measure has been removed. Note a new measure 3498e was withdrawn during the evaluation process and is summarized elsewhere in this report.

#### Table 3. Measure Withdrawn from Consideration

Measure	Reason for withdrawal
0678 Percent of Residents or Patients with Pressure	Developer has retired this measure and plans to adopt a
Ulcers That Are New or Worsened (Short-Stay)	new measure. Endorsement has been removed.

### References

- 1 James JT. A new, evidence-based estimate of patient harms associated with hospital care. *J Patient Saf.* 2013;9(3):122-128.
- 2 Makary MA, Daniel M. Medical error—the third leading cause of death in the US. *BMJ*. 2016;353:i2139.
- 3 AHRQ National Scorecard on Hospital-Acquired Conditions: Updated Baseline Rates and Preliminary Results 2014-2017. :27.
- 4 Aiken LH, Sloane DM, Barnes H, et al. Nurses' and patients' appraisals show patient safety in hospitals remains a concern. *Health Aff*. 2018;37(11):1744-1751.
- 5 Stimpfel AW, Fletcher J, Kovner CT. A comparison of scheduling, work hours, overtime, and work preferences across four cohorts of newly licensed Registered Nurses. *Journal of Advanced Nursing*. 0(0). <u>https://onlinelibrary.wiley.com/doi/abs/10.1111/jan.13972</u>. Last accessed July 2019.
- 6 Rogers AE, Hwang W-T, Scott LD, et al. The working hours of hospital staff nurses and patient safety. *Health Aff.* 2004;23(4):202-212.
- 7 Stone PW, Mooney-Kane C, Larson EL, et al. Nurse working conditions and patient safety outcomes. *Med Care*. 2007;45(6):571-578.
- 8 Stimpfel AW, Sloane DM, Aiken LH. The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. *Health Aff*. 2012;31(11):2501-2509.

## **Appendix A: Details of Measure Evaluation**

Rating Scale: H=High; M=Moderate; L=Low; I=Insufficient; NA=Not Applicable

#### **Measures Endorsed**

# 0138 National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submission | Specifications

**Description**: Standardized Infection Ratio (SIR) of healthcare-associated, catheter-associated urinary tract infections (UTI) will be calculated among patients in bedded inpatient care locations, except level II or level III neonatal intensive care units (NICU).

This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavior health hospitals.

**Numerator Statement**: Total number of observed healthcare-associated CAUTI among patients in bedded inpatient care locations (excluding patients in Level II or III neonatal ICUs).

**Denominator Statement**: Total number of predicted healthcare-associated CAUTI among inpatient care locations under surveillance for CAUTI during the data period, based on the national CAUTI baseline Data is calculated using the facility's number of catheter days and the following significant risk factors:

- Acute Care Hospitals: CDC Location, Facility bed size, Medical school affiliation, and Facility type
- Critical Access Hospitals: Medical school affiliation
- Long-Term Acute Hospitals: Average length of stay, Setting type, and Location type
- Inpatient Rehabilitation Facilities: Setting type, Proportion of admissions with traumatic and nontraumatic spinal cord dysfunction, Proportion of admissions with stroke

Exclusions: The following are not considered indwelling catheters by NHSN definitions:

- 1. 1. Suprapubic catheters
- 2. 2.Condom catheters
- 3. 3. "In and out" catheterizations
- 4. Nephrostomy tubes

Note, that if a patient has either a nephrostomy tube or a suprapubic catheter and also has an indwelling urinary catheter, the indwelling urinary catheter will be included in the CAUTI surveillance.

#### Adjustment/Stratification:

Level of Analysis: Facility, Other, Population : Regional and State

Setting of Care: Inpatient/Hospital, Other, Post-Acute Care

Type of Measure: Outcome

**Data Source**: Electronic Health Data, Electronic Health Records, Other, Paper Medical Records **Measure Steward**: Centers for Disease Control and Prevention

#### STANDING COMMITTEE MEETING 06/17/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-20; No Pass-0; 1b. Performance Gap: H-1; M-19; L-0; I-0

Rationale:

- The Committee agreed that there are preventive activities that can reduce the incidence of CAUTI. These include:
  - Appropriate catheter use
  - Proper techniques for urinary catheter insertion
  - Proper techniques for urinary catheter maintenance
- To support these practices, the developer cites a guideline from the Healthcare Infection Control Practices Advisory Committee (HICPAC): Guideline for Prevention of Catheter-Associated Urinary Tract Infections (2009) revised February 15, 2017.
- The developer provided national Standardized Infection Ratios (SIRs) for CAUTI in 2015, 2016, and 2017:
  - National Catheter-associated UTI SIR in 2015 is 0.993 = 28,712 observed / 28,910.634 predicted
  - National Catheter-associated UTI SIR in 2016 is 0.930 = 26,983 observed / 29,002.430 predicted
  - National catheter-associated UTI SIR in 2017 is 0.880 = 24,865 observed / 28,241.960 predicted
- The developer also reports that there was a 6% decrease in CAUTI between 2015 and 2016, and a 5% decrease between 2016 and 2017.
- The Committee agreed that there is a performance gap warranting measurement in this area; Committee members suggested that the developer analyze and provide data related to performance across different types of institutions (e.g., rehabilitation, acute care, long-term care, etc.).
- The Committee also discussed performance gaps on this measure with respect to variation across ethnic groups, rural vs. urban areas, hospital size, and other factors.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria.</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)
2a. Reliability: M-14; L-4; I-0; 2b. Validity: M-10; L-8; I-2 | Validity: (Revote on post-comment call 9/18/19): M-13; L-4; I-2

• This measure is deemed as complex and was evaluated by the NQF Scientific Methods Panel.

The Standing Committee chose to vote on this measure for, both, reliability and validity.

#### Rationale:

- This measure was reviewed for Scientific Acceptability by NQF's Scientific Methods Panel (SMP).
- Data element validity testing was conducted, which NQF accepts as a demonstration of data element reliability.
- There was some question from SMP reviewers about the appropriateness of using data element validity testing to stand in for reliability testing. NQF reminded the group that NQF allows this substitution.
- The developer notes that the critical data elements of this measure have been validated by several state health departments that require mandatory reporting of CAUTI through the NHSN.

- Data validation is conducted by trained auditors, who review medical records and determine whether facilities' identification of patients meeting CAUTI criteria were accurate.
- Sensitivity, specificity, positive predicted value, and negative predicted value are calculated.
- Validation results from 10 states are provided—the developer reports that these validations indicated a pooled mean sensitivity of 88.1% (range: 50%-95.6%), specificity of 99.1% (range: 91.4% 100%), positive predictive value of 94.4% (range: 84.6% 100%) and negative predictive value of 97.9% (range: 91.4% 99.8%).
- Some SMP reviewers expressed concern about the lack of measure score testing, given that this is a maintenance measure. NQF clarified that either empirical data element or score-level testing are acceptable validity testing methods for maintenance measures.
- The measure uses a statistical risk model with risk factors relevant to the facility type. No social risk factors are applied in the modeling.
- There was some concern that no statistical results (e.g., c-statistic) of model power were reported.
- The Patient Safety Standing Committee discussed the definition of UTIs and the timeframe for determining whether or not a CAUTI is present but focused its discussion largely on the issue of appropriate exclusions, particularly for spinal cord injury (SCI) patients.
- A number of representatives of the SCI physician community submitted comments and/or attended the Committee meeting in person to voice their concerns about the measure. These commenters suggested that the measure could be causing unintended adverse consequences by encouraging bladder management practices that are inconsistent with appropriate SCI care and have led to harm for SCI patients.
- Representatives of the developer organization (CDC) maintained that there was not enough rigorous evidence supporting exclusion of SCI patients, adding that SCI patients are at high risk for CAUTI and should not be removed from the measure.
- Committee members expressed their desire to find a resolution to this issue, noting their general support for the measure and their appreciation of the need for evidence to support exclusions, while also acknowledging that the SCI community had brought forth compelling information suggesting that harm to SCI patients could be an unintended consequence of this measure.
- The Committee voted to pass the measure on the Reliability criterion, but consensus was not reached on the Validity criterion.
- After the public comment period, the Committee revisited their evaluation of this measure. The Committee reviewed submitted comments, and heard from both the developer and representatives of the SCI physician community, who reiterated their positions on the measure.
- The Committee acknowledged the potential unintended consequences of this measure for SCI patients, but noted that it is an outcome measure, and does not prescribe specific behavior, such as removal of Foley catheters.
- Committee members observed that measuring this outcome may create incentives for certain behaviors, but added that health care providers must treat each patient individually and use their best judgment as to how care should be approached.
- The Committee suggested that the benefits of this measure are strong enough to warrant its continued endorsement, and passed the measure on the Validity criterion.

#### 3. Feasibility: H-2; M-18; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

Rationale:

- Data for the measure are collected through the National Healthcare Safety Network (NHSN) using a set of standardized forms.
- The developer reports that CAUTI and catheter days (the numerator and denominator) must be collected by trained hospital staff from information available in clinical data sources.
- The developer notes that some of the data used in the measure can be mined from electronic sources, adding that NHSN is moving towards an electronically captured CAUTI measure for future use. However, development and testing is not complete at this time; barriers include a lack of consistency in the use of electronic records across different platforms and facility types.
- The Committee noted that this measure does require manual abstraction of clinical information, but agreed that measuring CAUTI rates is worth the effort.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

#### 4a. Use: Pass-20; No Pass-0 4b. Usability: H-0; M-18; L-0; I-0

#### Rationale:

- The measure is used in several accountability programs, including:
  - o Hospital Inpatient Quality Reporting Program (HIQR)
  - o Hospital Value-Based Purchasing
  - o Hospital-Acquired Condition Reduction Program (HACRP)
- The developer notes that SIR results are available to NHSN users at any time, based on their current data entry. Data provided within the analysis report includes numerator, denominator, SIR, p-value, and 95% confidence interval. Educational materials are available on the NHSN website that explain each data element.
- Based on results from a polling survey, hospitals have indicated that they are running SIR analysis reports within NHSN on a monthly basis, and that they use SIRs for prevention activities in their hospital. State health departments are using the SIR for public reporting purposes and to help target facilities for additional prevention. Feedback was received via email regarding the extent of risk adjustment and the limitations.

#### 5. Related and Competing Measures

• No related or competing measures noted.

#### 6. Standing Committee Recommendation for Endorsement: Yes-13; No-5

#### 7. Public and Member Comment

- Eight comments were received regarding this measure from three commenters. One commenter was not supportive of the measure as currently specified, explaining in detail the measure's unintended adverse consequences for patients with spinal cord injury (with references included for various points) and suggesting specific key topics that should be re-examined and resolved. Another commenter shared that individual clinicians may attempt to reduce urinary catheter use in patients who require continuous bladder drainage, but noted that this represents a small patient subpopulation and should not warrant removal of endorsement. Another comment expressed concern that the validity testing is aggregated at the state level rather than for each facility and that results are not presented for each data element.
  - Developer Response: NHSN's surveillance protocol and reporting guidance for the 0 system's users and NHSN's clinical quality measures do not recommend or call for preferential use of specific clinical practices or procedures. The protocol, guidance, and measures are designed for purposes of tracking, summarizing, and responding to adverse events that are associated with use of specific practices or procedures or exposures to other healthcare risks. Because spinal cord injured patients are at high risk for catheter-associated urinary tract infections (CAUTIs), these patients are included in NHSN's CAUTI surveillance protocol, reporting guidance and clinical quality measure. To exclude this patient population without compelling evidence of unintended adverse consequences attributable to including them would preclude the availability of surveillance and measure data for prevention and quality improvement purposes. NHSN readily acknowledges that clinical quality measures can have unintended consequences and is prepared to respond accordingly, including excluding affected patient populations, if there are compelling reasons to do so. Anecdotal reports of unintended consequences of the CAUTI measure on bladder management of spinal cord injured patients fall short of actionable data. A systematic study confirming the purported unintended adverse consequence of the CAUTI measure has yet to be reported perhaps not yet initiated despite NHSN's recommendations to design and complete such a study. NHSN remains committed to surveillance and measurement of adverse events in healthcare and providing comprehensive, high caliber data for measurement purposes and to guide prevention and quality improvement.

Reliability testing of critical data elements is performed by many of the state health departments that have implemented mandatory reporting of CAUTI data to the state using NHSN as the data entry system and the source of case definitions and surveillance methodology. NHSN provides a guidance toolkit that suggests the selection methodology of a sample of facilities and medical charts to determine the accuracy of data elements. The recommended sample sizes are developed with a priori assumptions of expected accuracy and prevalence of CAUTI events. The state health departments using the NHSN guidance methodology conduct external validations. Data validations are conducted at each facility and facility specific data accuracy estimates are provided to each facility by the respective state health departments. These data are shared with NHSN on an aggregate level for estimation of state specific accuracy of reporting.

NHSN has confidence that the sampling methodology as described is adequate for purposes of rendering estimates of accuracy and meets the NQF criteria for data

element validity. Testing for this measure has satisfactorily been through the rigor of NQF Methods Panel and was passed. If the commenter continues to have concerns about validity testing for this measure, we would be willing to talk further with the commenter about this concern.

#### 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-13; No-0 (10/21/2019)

#### **Decision: Approved for continued endorsement**

#### 9. Appeals

No appeals were received.

# 0139 National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure

#### Submission Specifications

**Description**: Standardized Infection Ratio (SIR) and Adjusted Ranking Metric (ARM) of healthcareassociated, central line-associated bloodstream infections (CLABSI) will be calculated among patients in bedded inpatient care locations.

This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavioral health hospitals.

**Numerator Statement**: Total number of observed healthcare-associated CLABSI among patients in bedded inpatient care locations.

**Denominator Statement**: Total number of predicted healthcare-associated CLABSI among patients in bedded inpatient care locations, calculated using the facility's number of central line days and the following significant risk factors:

- Acute Care Hospitals: CDC location, facility bed size, medical school affiliation, facility type, birthweight category (NICU locations only)
- Critical Access Hospitals: no significant risk factors, calculation based intercept only model
- Inpatient Rehabilitation Facilities: Proportion of admissions with stroke, proportion of admissions in other non-specific diagnostic categories
- Long Term Acute Care Hospitals: CDC location type , facility bed size, average length of stay, proportion of admissions on a ventilator, proportion of admissions on hemodialysis

**Exclusions**: Data from patients who are not assigned to an inpatient bed are excluded from the denominator counts, including outpatient clinics, 24-hour observation units, and emergency department visits. Inpatient rehab locations and inpatient psychiatric locations that have their own Centers for Medicare and Medicaid Services (CMS) Certification Number (CCN) are excluded.

Adjustment/Stratification: Statistical risk model

Level of Analysis: Facility, Population : Regional and State

**Setting of Care:** Inpatient/Hospital, Other, Post-Acute Care

Type of Measure: Outcome

Data Source: Electronic Health Data, Electronic Health Records, Other, Paper Medical Records

#### Measure Steward: Centers for Disease Control and Prevention

#### STANDING COMMITTEE MEETING 06/17/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-20; No Pass-0; 1b. Performance Gap: H-5; M-15; L-0; I-0

#### Rationale:

- The Committee agreed that there are preventive activities that can reduce the incidence of CLABSI; these include:
  - o Appropriate central line use: promptly removing non-essential intravascular catheters,
  - Hand hygiene and aseptic technique
  - The use of maximal barrier equipment including a large patient drape, inserter mask, sterile gloves, cap, and sterile gown during aseptic insertion of the central line
  - Appropriate insertion site decontamination before central line insertion
  - O Chlorhexidine-impregnated dressings (in patients ≥ 18 years), and (vi) implementing surveillance strategies
- To support these practices, the developer cites a guideline:
  - O'Grady NP, Alexander M, Burns LA, Dellinger PE, Garland J, et al. Guidelines for the prevention of intravascular catheter-related infections. Available at <u>http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf</u>.
- The developer provided national Standardized Infection Ratios (SIRs) for CAUTI in 2015, 2016, and 2017:
  - National CLABSI SIR in 2015 is 0.994 = 26,029 observed / 26,183.537 predicted
  - National CLABSI SIR in 2016 is 0.891 = 23,591 observed / 26,472.710 predicted
  - National CLABSI SIR in 2017 is 0.814 = 21,173 observed / 25,993.180 predicted
- The developer also reports that there was a 10% decrease in CLABSI between 2015 and 2016, and a 9% decrease between 2016 and 2017.
- The Committee discussed performance gaps on this measure with respect to variation across ethnic groups, rural vs. urban areas, hospital size, and other factors.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity

• This measure is deemed as complex and was evaluated by the NQF Scientific

2a. NQF Scientific Methods Panel Ratings for Reliability: H-0; M-4; L-0; I-0

2b. NQF Scientific Methods Panel Ratings for Validity: H-0; M-3 L-1; I-0

#### (The Committee accepted the NQF Scientific Methods Panel's Moderate rating, unanimously.) Rationale:

- Data element validity testing was conducted, which NQF allows to serve as a demonstration of data element reliability.
- The developer notes that the critical data elements of this measure have been validated by a number of state health departments that require mandatory reporting of CLABSI through the NHSN.

- Data validation is conducted by trained auditors, who review medical records and determine whether facilities' identification of patients meeting or not meeting CLABSI criteria was accurate.
- Sensitivity, specificity, positive predicted value, and negative predicted value were calculated.
- Validation results from 5 states are provided—the developer reports that these validations indicated a pooled mean sensitivity of 87.5% (range: 80.3%-100%), specificity of 99.3% (range: 98.7% 100%), positive predictive value of 96.9% (range: 94.2% 100%) and negative predictive value of 96.9% (range: 93.7% 100%).
- Committee members discussed the relationship between 'catheter days' and infections, noting that CLABSI risk likely increases the longer a line is left in.
  - The developer noted that CDC is exploring ways of incorporating this and other factors into measurement calculations.
- This measure was reviewed against the Scientific Acceptability criteria by NQF's Scientific Methods Panel (SMP); the SMP judged it to have met NQF's standards for reliability and validity.
- The Patient Safety Standing Committee accepted the SMP's ratings.

#### 3. Feasibility: H-1; M-19; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

Rationale:

- Data for the measure are collected through the National Healthcare Safety Network (NHSN) using a set of standardized forms.
- The developer reports that CLABSI and central line days (the numerator and denominator) must be collected by trained hospital staff from information available in clinical data sources.
- The developer noted that some of the data used in the measure can be mined from electronic sources, adding that NHSN is moving towards an electronically captured CAUTI measure for future use. However, development and testing are not complete at this time.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

4a. Use: Pass-20; No Pass-0 4b. Usability: H-7; M-13; L-0; I-0 Rationale:

- Kationale.
  - The measure is used in several accountability programs, including:
    - Hospital Inpatient Quality Reporting Program (HIQR)
    - Hospital Value-Based Purchasing
    - o Hospital-Acquired Condition Reduction Program (HACRP)
  - The Committee agreed that this measure meets the Use & Usability criteria, noting that it is used in federal payment and public reporting programs.
  - Committee members did raise caution about potential 'gaming' of the measure, suggesting that the developer should be watchful for these issues and find ways of addressing them.

#### 5. Related and Competing Measures

• No related or competing measures noted.

#### 6. Standing Committee Recommendation for Endorsement: Yes-20; No-0

#### 7. Public and Member Comment

- One commenter expressed the same concern about the validity testing for this measure as for measure 0138. The commenter is concerned that the validity testing is aggregated at the state level rather than for each facility and that results are not presented for each data element. Accordingly, the developer's response is essentially the same.
  - Developer Response: Reliability testing of critical data elements is performed by many of the state health departments that have implemented mandatory reporting of CLABSI data to the state using NHSN as the data entry system and the source of case definitions and surveillance methodology. NHSN provides a guidance toolkit that suggests the selection methodology of a sample of facilities and medical charts to determine the accuracy of data elements. The recommended sample sizes are developed with a priori assumptions of expected accuracy and prevalence of CLABSI events. The state health departments using the NHSN guidance methodology conduct external validations. Data validations are conducted at each facility and facility specific data accuracy estimates are provided to each facility by the respective state health departments. These data are shared with NHSN on an aggregate level for estimation of state specific accuracy of reporting.

NHSN has confidence that the sampling methodology as described is adequate for purposes of rendering estimates of accuracy and meets the NQF criteria for data element validity. Testing for this measure has satisfactorily gone through the rigor of NQF Methods Panel and was passed. If the commenter continues to have concerns about validity testing for this measure, we would be willing to talk further with the commenter about this concern.

## 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019)

#### **Decision: Approved for continued endorsement**

#### 9. Appeals

No appeals were received.

# 0204 Skill mix (Registered Nurse [RN], Licensed Vocational/Practical Nurse [LVN/LPN], unlicensed assistive personnel [UAP], and contract)

#### Submission | Specifications

**Description**: NSC-12.1 - Percentage of total productive nursing hours worked by RN (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.2 - Percentage of total productive nursing hours worked by LPN/LVN (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.3 - Percentage of total productive nursing hours worked by UAP (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.4 - Percentage of total productive nursing hours worked by contract or agency staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities by hospital unit.

Note that the skill mix of the nursing staff (NSC-12.1, NSC-12.2, and NSC-12.3) represent the proportions of total productive nursing hours by each type of nursing staff (RN, LPN/LVN, and UAP); NSC-12.4 is a separate rate.

Measure focus is structure of care quality in acute care hospital units.

Numerator Statement: Four separate numerators are as follows:

RN hours – Productive nursing care hours worked by RNs with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

LPN/LVN hours – Productive nursing care hours worked by LPNs/LVNs with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

UAP hours – Productive nursing care hours worked by UAP with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

Contract or agency hours – Productive nursing care hours worked by nursing staff (contract or agency staff) with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

**Denominator Statement**: Denominator is the total number of productive hours worked by employee or contract nursing staff with direct patient care responsibilities (RN, LPN/LVN, and UAP) for each hospital in-patient unit during the calendar month.

Exclusions: Same as numerator; nursing staff with no direct patient care responsibilities are excluded.

**Adjustment/Stratification**: Other Each unit is stratified by unit type (e.g., critical care, step down, medical), which is not identical to risk, but may be related.

Level of Analysis: Facility, Other

Setting of Care: Inpatient/Hospital

Type of Measure: Structure

Data Source: Management Data, Other

Measure Steward: American Nurses Association

#### STANDING COMMITTEE MEETING 06/24/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: H-5; M-11; L-1; I-0; 1b. Performance Gap: H-1; M-12; L-3; I-1 Rationale:

- The Committee agreed this structure measure is important as it assesses the percentage of total productive nursing hours (employee and contract) with direct patient care responsibilities by hospital unit.
- The developer provided data of differences in skill mix by unit type across all National Database of Nursing Quality Indicators (NDNQI) participating hospitals that provided nurse staffing data for 2017. In addition, the developer provided difference in skill mix in hospital types (i.e. bed size, teaching status, magnet status, rural/metropolitan).
- The developer also cited literature linking skill mix to patient outcomes.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity

2a. Reliability: H-6; M-9; L-1; I-0; 2b. Validity: H-3; M-11; L-2; I-0

Rationale:

- Reliability testing was done at the performance score level and tested the stability of measures across time for nursing care hours data collected from the National Database of Quality Indicators from January 1, 2016-April 30, 2017. Reliability at the Unit-Level and Hospital-Level were reported for Skill Mix and the intraclass correlation coefficient (ICC) results ranged from 0.86-0.92. (>0.8 is high reliability).
- The developer performed convergent validity testing with correlation coefficients and compared Skill Mix (%RN) in the NDNQI<sup>®</sup> database with the staffing levels reported by RNs in each unit from the RN survey. The correlation coefficients were "strong" at the unit level, however weaker at the hospital level. The developer attributed the lower results at the hospital level to unit-level variation in nurse staffing in hospital. The Committee was satisfied with this rationale.
- The Committee had no concerns on the reliability and validity testing of the measure.

#### 3. Feasibility: H-0; M-14; L-2; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

<u>Rationale</u>:

- The measure is generated from electronic payroll/accounting report or electronic staffing system.
- Committee members noted significant education done to promote appropriate data collection of nursing care hours in the NDNQI database and that nursing as whole is highly invested in the NDNQI database.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

4a. Use: Pass-19; No Pass-1 4b. Usability: H-1; M-18; L-1; I-0

#### Rationale:

- The measure is currently publicly reported in four states and also by the American Nurses Credentialing Center (ANCC) as part of their Magnet Recognition Program and Pathways to Excellence Recognition Program.
- One Committee member would like to see more states than the current four states using the measure and more adoption by rural hospitals. The developer noted this measure is being considered for CMS inpatient quality reporting program at the national level and the conversation has been ongoing.
- A few Committee members noted it would be helpful to have a consumer-based report for hospitals below the mean to share skill-mix information with consumers.

#### 5. Related and Competing Measures

- This measure 0204 is related with NQF 0205 Nursing Hours per Patient Day.
- Measure 0204 is a ratio of the RN hours and Total Nursing Hours elements that are the numerator for the rates tested in measure 0205.
- The Committee discussed whether both measures 0204 and 0205 were needed and brought up the potential of the creation of a single measure.
- The developer noted that the measure elements are completely harmonized. The developer noted that both measures help inform nurse staffing, and there is no additional data collection burden by having both measures.

#### 6. Standing Committee Recommendation for Endorsement: Yes-19; No-1

<u>Rationale</u>

- The Standing Committee recommended the measure for continued endorsement.
- The Committee agreed this structure measure is important as it assesses the percentage of total productive hours worked by RNs (employee and contract) with direct patient care responsibilities by hospital units.

#### 7. Public and Member Comment

• NQF did not receive comments following the Committee's evaluation of the measure.

#### 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019)

#### **Decision: Approved for continued endorsement**

#### 9. Appeals

No appeals were received.

#### **0205 Nursing Hours per Patient Day**

#### Submission | Specifications

**Description**: NSC-13.1 (RN hours per patient day) – The number of productive hours worked by RNs with direct patient care responsibilities per patient day for each in-patient unit in a calendar month.

NSC-13.2 (Total nursing care hours per patient day) – The number of productive hours worked by nursing staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities per patient day for each inpatient unit in a calendar month.

Measure focus is structure of care quality in acute care hospital units.

**Numerator Statement**: Total number of productive hours worked by nursing staff with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

**Denominator Statement**: Denominator is the total number of patient days for each in-patient unit during the calendar month. Patient days must be from the same unit in which nursing care hours are reported.

**Exclusions**: Patient days from some non-reporting unit types, such as Emergency Department, perioperative unit, and obstetrics, are excluded.

**Adjustment/Stratification**: Other Each unit is stratified by unit type (e.g., critical care, step down, medical), which is not identical to risk, but may be related.

Level of Analysis: Facility, Other

Setting of Care: Inpatient/Hospital

Type of Measure: Structure

Data Source: Management Data, Other

Measure Steward: American Nurses Association

#### STANDING COMMITTEE MEETING 07/02/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: H-0; M-18; L-1; I-0; 1b. Performance Gap: H-4; M-14; L-1; I-0

<u>Rationale</u>:

- The Committee agreed this structure measure is important as it assesses the number of productive hours worked by RNs with direct patient care responsibilities per patient day for each in-patient unit in a calendar month.
- The developer provided data of differences in nursing care hours by unit type across all National Database of Nursing Quality Indicators (NDNQI) participating hospitals that provided nurse staffing data for 2017. In addition, the developer provided difference in nursing care hours in hospital types (i.e. bed size, teaching status, magnet status, rural/metropolitan).
- The developer also cited literature linking nursing hours per patient day to patient outcomes.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)

2a. Reliability: H-3; M-15; L-1; I-0; 2b. Validity: H-2; M-16; L-1; I-0 Rationale:

- Reliability testing was done at the performance score level and tested the stability of measures across time for nursing care hours data collected from the National Database of Quality Indicators from January 1, 2016-April 30, 2017. Reliability at the Unit-Level and Hospital-Level were reported for patient day adjusted nursing hours and the intraclass correlation coefficient (ICC) results ranged from 0.70-0.85. (>0.8 is high reliability).
- The developer performed convergent validity testing with correlation coefficients and compared nursing care hours (both RN and total hours) in the NDNQI<sup>®</sup> database with the staffing levels reported by RNs in each unit from the RN survey. The correlation coefficients were "strong" at the unit level, however weaker at the hospital level. The developer attributed the lower results at the hospital level to unit-level variation in nurse staffing in hospital. The Committee was comfortable with the high correlation coefficients at the unit level and believed the unit level was more pertinent to the validity of the measure.
- The Committee had no concerns on the reliability and validity testing of the measure.

#### 3. Feasibility: H-4; M-15; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

Rationale:

- The measure is generated from electronic payroll/accounting report or electronic staffing system.
- The developer noted that the majority of hospitals have an electronic staffing system or payroll to pull the data and very few are working off a paper record.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

#### 4a. Use: Pass-18; No Pass-1 4b. Usability: H-7; M-11; L-1; I-0

Rationale:

- The measure is currently publicly reported in 7 states and also by the American Nurses Credentialing Center (ANCC) as part of their Magnet Recognition Program and Pathways to Excellence Recognition Program.
- The developer noted this measure is being considered for CMS inpatient quality reporting program at the national level and the conversation has been ongoing.
- A few Committee members noted it would be helpful to have a consumer-based report for hospitals below the mean to share skill-mix information with consumers.

#### 5. Related and Competing Measures

• This measure 0205 is related with NQF 0204 Skill mix (Registered Nurse [RN], Licensed Vocational/Practical Nurse [LVN/LPN], unlicensed assistive personnel [UAP], and contract).

- Measure 0204 is actually a ratio of the RN hours and Total Nursing Hours elements that are the numerator for the rates tested in measure 0205.
- The Committee discussed whether both measures 0204 and 0205 were needed and brought up the potential of the creation of a single measure.
- The developer noted that the measure elements are completely harmonized. The developer noted that both measures help inform nurse staffing, and there is no additional data collection burden by having both measures.

#### 6. Standing Committee Recommendation for Endorsement: Yes-18; No-1

#### **Rationale**

- The Standing Committee recommended the measure for continued endorsement.
- The Committee agreed this structure measure is important as it assesses the number of productive hours worked by RNs with direct patient care responsibilities per patient day for each in-patient unit in a calendar month.

#### 7. Public and Member Comment

• NQF did not receive comments following the Committee's evaluation of the measure.

#### 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019)

#### **Decision: Approved for continued endorsement**

#### 9. Appeals

No appeals were received.

#### 2720 National Healthcare Safety Network (NHSN) Antimicrobial Use Measure

#### Submission | Specifications

**Description**: This measure assesses antimicrobial use in hospitals based on medication administration data that hospitals collect electronically at the point of care and report via electronic file submissions to CDC's National Healthcare Safety Network (NHSN). The antimicrobial use data that are in scope for this measure are antibacterial agents administered to adult and pediatric patients in a specified set of ward and intensive care unit locations: medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only). The measure compares antimicrobial use that the hospitals report with antimicrobial use that is predicted on the basis of nationally aggregated data. The measure is comprised of a discrete set of ratios, Standardized Antimicrobial Administration Ratios (SAARs), each of which summarizes observed-to-predicted antimicrobial use for one of 40 antimicrobial agent-patient care location combinations. The SAARs are designed to serve as high vaue targets or high level indicators for antimicrobial stewardship programs (ASPs). SAAR values that are outliers are intended to prompt

analysis of possible overuse, underuse, or inappropriate use of antimicrobials, subsequent actions aimed at improving the quality of antimicrobial prescribing, and impact evaluations of ASP interventions.

**Numerator Statement**: Days of antimicrobial therapy for antimicrobial agents administered to adult and pediatric patients in medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only).

**Denominator Statement**: Days present for each patient care location—adult and pediatric medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only) is defined as the number of patients who were present for any portion of each day of a calendar month for each location. The day of admission, discharge, and transfer to and from locations are included in days present. All days present are summed for each location and month, and the aggregate sums for each location-month combination comprise the denominator data for the measure.

**Exclusions**: Hospital patient care locations other than adult and pediatric medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only) are excluded from this measure.

Adjustment/Stratification: Statistical risk model

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital

Type of Measure: Process

Data Source: Paper Medical Records, Registry Data

Measure Steward: Centers for Disease Control and Prevention

#### STANDING COMMITTEE MEETING 06/24/2019

1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: H-2; M-13; L-3; I-0; 1b. Performance Gap: H-4; M-13; L-1; I-0 Rationale:

- Data from the ISDA/SHEA guidelines for developing an institutional program to enhance antimicrobial stewardship (2007) was presented along with four other systematic reviews. The evidence provided supports the link between ASPs/effective antimicrobial prescribing and positive outcomes including a reduction in CDI and colonization/infection with certain bacteria, a decrease in antibiotic use in critical care patients, a reduction in the prevalence of resistant gram-negative bacteria and C. diff infection, a reduction in mortality for patients with pneumonia.
- The Committee agreed that the evidence presented demonstrates a strong link between antimicrobial stewardship and better patient outcomes, including a decrease in C. difficile rates. There was some question as to the link between the measure and improved antibiotic and resistance rates.
- Regarding performance gap, for all agents and units for the adult population, 44% of SAARs are lower than 1, while 45% of SAARs are greater than 1. For all agents and units for the pediatric population, 43% of SAARs are lower than 1, while 40% are greater than 1.

- The Committee discussed that SAAR values that are outliers, prompt analysis of possible overuse, underuse, or inappropriate use, but there is not a perfect way to determine the "right" amount of antibiotic use. Other members agreed conceptually but recognized the lack of data and information available in this area.
- The developer also acknowledged they are collecting data on antimicrobial resistance and C. difficile rates and plan to examine these relationships further in the future.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)
2a. Reliability: H-0; M-17; L-1; I-0; 2b. Validity: H-0; M-17; L-1; I-0
Rationale:

- The developer conducted validity testing of the numerator and denominator data elements.
  - Antimicrobial days numerator: percent agreement 60-80% (at the outset of validation) and Days present denominator: percent agreement 70-80% (at the outset of validation). By design the process led to >99% agreement for all required data elements prior to data submission to CDC.
- Face validity was also tested by an expert panel of infectious disease physicians and clinical pharmacists.
- The measure is risk adjusted, and each group of SAAR antimicrobial agents is modeled separately
- The Committee accepted the testing presented.
- One Committee member asked if the developer is considering an analysis by infection type, but the developer noted that infection data are not captured in the current version of the measure.
- There was discussion that data used to build the model will always be behind the current state of antimicrobial prescribing. The CDC advised that the developer use the most recently reported data (CY 2017 for the updated measure) to build their predictive models.

# 3. Feasibility: H-3; M-14; L-0; I-1

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented) Rationale:

- The measure uses electronic health data, electronic format Admission Discharge Transfer that is in defined fields in electronic sources and routinely generated.
  - One Committee member questioned whether using a proxy (i.e., claims data) to capture information would be an alternative way to gather useful data about antimicrobial use.

# 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

4a. Use: Pass-16; No Pass-2 4b. Usability: H-3; M-11; L-2; I-1 Rationale:

- Regarding use, the measure is not proposed for public reporting or payment at this time but is being used to gauge stewardship intervention. One Committee member wanted to see the data showing that measure use has driven change in prescribing practices. Overall, the Committee believed that although this measure is not ready for accountability, the measure is important as it serves as a marker of potential inappropriate use to drive stewardship.
- One Committee member wanted to see the data showing that measure use has driven change in prescribing practices.
- The Committee agreed that broad use provides data needed to refine predictive models so that measured performance accurately distinguishes quality care and differences across facilities.
- In almost all states, at least some hospitals are reporting data to the NHSN and gaining access to benchmark data.
- The developer added that more than 1,200 hospitals are now reporting data (approximately a five-fold increase since first endorsed) and can use results for stewardship purposes.

#### 5. Related and Competing Measures

• No related or competing measures noted.

#### 6. Standing Committee Recommendation for Endorsement: Yes-15; No-2

#### 7. Public and Member Comment

- Two commenters highlight areas of concern regarding the measure. One commenter suggested that risk adjustment or stratification of institutions by additional attributes may help improve measure utility and noted persistent low levels of reporting and the complexity of reporting to the NHSN AU module. The commenter also highlighted that it is problematic that small hospitals, least likely to have an antibiotic stewardship program, are inadequately represented in the measure as they lack infrastructure to report. Another commenter stated that since the measure is not appropriate for accountability purposes at this time, they do not believe the measure should maintain endorsement.
  - Developer Response: The standardized antimicrobial administration ratio (SAAR) is the 0 statistical centerpiece of the NHSN Antimicrobial Use measure that was endorsed by NQF in December 2015 and that is under review for re-endorsement. In the time period since the measure was initially endorsed, the number of hospitals participating in NHSN's antimicrobial use (AU) surveillance has increased seven-fold, to over 1400 hospitals. These hospitals submit AU data to NHSN and use NHSN's analytic features to benchmark their AU performance. The SAAR is the statistical measure by which hospitals can benchmark their performance to all hospitals participating in NHSN's AU surveillance. While the commenter reports that there is "still controversy about how to conduct inter-institutional comparisons" with the SAAR metric, CDC is pleased to report that hundreds of hospitals are using SAAR data to make valid comparisons, enabling those hospitals to identify opportunities to improve antimicrobial prescribing. Further, NHSN has worked to improve the SAAR predictive models in the AU measure proposal submitted for re-endorsement consideration, and these improvements include taking additional predictive factors into account such as average length of stay and percentage

of beds that are in an ICU. The commenter expresses concerns about "persistent low levels of reporting" of AU data to NHSN, a concern that is corrected and mitigated by substantial and steady increases in hospital participation in NHSN's AU surveillance. To address the commenter's concern about poor representation in the NHSN AU data for hospitals less than 200 beds, the median (and interguartile range) among hospitals reporting AU data from adult patient care locations in 2017 was 176 (86, 307). The commenter also expresses concerns about the complexity and costs of that participation, which again overlooks the fact that participation is rapidly increasing and is all voluntary. No state or federal mandates have required hospitals to submit AU data to NHSN. If complexity and costs are prohibitive, why do hospitals continue to join? The commenter observes that "automated platforms" may eventually augment AU reporting to NHSN, an observation that overlooks the fact that all AU reporting to NHSN is automated. There is no manual data entry. Despite the commenter's concerns, we are pleased that the commenter supports the NHSN AU module "as written." NHSN also agrees that the AU measure submitted to NQF for re-endorsement consideration should not be used for public reporting and reimbursement purposes. That said, NHSN supports use of the measure for non-publicly reported comparisons of antibiotic use between facilities, and NHSN looks forward to further work with hospitals throughout the U.S. that are using the measure for precisely that purpose.

NHSN serves as a national data aggregating system for AU and engages with multiple antimicrobial stewardship programs that use of AU data for stewardship purposes on a voluntary basis. The continuing growth in AU reporting to NHSN —a greater than fivefold increase in hospital participation since NQF initially endorsed the NHSN AU measure —is indicative of the measure's value even without an external accountability application. As a result of this increased participation in AU reporting, much more AU data was available for NHSN to develop AU predictive models used in this measure proposal than were used in the initial proposal. Additional data, e.g., extent of infectious disease burden and indications for antimicrobial prophylaxis, are candidates for additions to NHSN's AU predictive models. NHSN is working to identify or develop sources for these additional data, and will apply this work and work products in the next iteration of its AU predictive models.

# 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019)

# Decision: Approved for continued endorsement

9. Appeals

No appeals were received.

# 2726 Prevention of Central Venous Catheter (CVC)-Related Bloodstream Infections

# Submission | Specifications

**Description**: Percentage of patients, regardless of age, who undergo central venous catheter (CVC) insertion for whom CVC was inserted with all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques followed

**Numerator Statement**: Patients for whom central venous catheter (CVC) was inserted with all elements of maximal sterile barrier technique\*, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques\*\* followed

Definitions:

\*Maximal sterile barrier technique includes ALL of the following elements:

- cap
- mask
- sterile gown
- sterile gloves
- sterile full body drape
- \*\* Sterile ultrasound techniques require sterile gel and sterile probe covers

Denominator Statement: All patients, regardless of age, who undergo CVC insertion

#### Exclusions: None

The measure includes a denominator exception as indicated by reporting 6030F-1P for the numerator: Documentation of medical reason(s) for not following all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques during CVC insertion (including increased risk of harm to patient if adherence to aseptic technique would cause delay in CVC insertion)

Adjustment/Stratification: No risk adjustment or risk stratification

Level of Analysis: Clinician : Group/Practice, Clinician : Individual

Setting of Care: Inpatient/Hospital

Type of Measure: Process

Data Source: Registry Data

Measure Steward: American Society of Anesthesiologists

#### STANDING COMMITTEE MEETING 06/17/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: H-4; M-16; L-0; I-0; 1b. Performance Gap: H-1; M-12; L-7; I-0

Rationale:

 The evidence was unchanged from the past review and included various recommendation statements from the CDC's Guidelines for the Prevention of Intravascular Catheter-Related Infections as well as studies showing the link between maximal sterile barrier technique and catheter-related bloodstream infections.

- Average performance rates from MIPS data were 93.9% in 2016, 94.2% in 2017, and 97.08% in 2018, with standard deviations around 15.7% each year.
- The Committee discussed whether the measure had potentially topped out and if there is still a performance gap; however, they acknowledged that although mean performance rates have increased, the standard deviation indicates there is still performance variability.
- The Committee also acknowledged that it is possible to achieve 100 percent performance, and MIPS data may overestimate actual performance nationwide.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity) 2a. Reliability: **H-2**; **M-14**; **L-4**; **I-0**; 2b. Validity: **H-1**; **M-17**; **L-2**; **I-0** 

Rationale:

- The Committee accepted the previous score-level reliability testing, which showed reliability scores >0.9, and updated validity testing that compared average reporting rates to CLABSI SIRs over the same time period.
- Face validity was also performed previously; 17 of 19 TEP members agreed that the scores from the measure as specified would provide an accurate reflection of quality and two disagreed.
- There was also some concern that self-reported rates versus observed rates of appropriate catheter insertion technique may be different.
- In future submissions, the Committee requested more specificity in the analysis of the measure and the outcome of infections, as well as data regarding opt outs and percentage of lines placed in the U.S. versus those being captured in the registry.

# 3. Feasibility: H-2; M-18; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

Rationale:

- The measure uses registry data and limited propriety coding is included in the specifications.
- In response to a member's questions, the developer provided information that all elements of maximal sterile barrier technique must be completed in order to meet numerator requirements.

# 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

# 4a. Use: Pass-19; No Pass-1 4b. Usability: H-1; M-17; L-2; I-0 Rationale:

• The measure is used in MIPS and for external benchmarking in the Anesthesia Quality Institute (AQI) National Anesthesia Clinical Outcomes Registry (NACOR).

#### 5. Related and Competing Measures

- This measure is related to but not directly competing with measure 0139: National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure
  - Differences include measure type (process versus outcome) and different levels of analysis (2726 is specified at the clinician level, while 0139 is specified at the facility level).
- The Committee previously discussed that both process and outcome measures exist around this issue, and the developer explained that the measures are complimentary and serve different purposes.

#### 6. Standing Committee Recommendation for Endorsement: Yes-18; No-2

#### 7. Public and Member Comment

• NQF did not receive comments following the Committee's evaluation of the measure.

# 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019)

#### **Decision: Approved for continued endorsement**

#### 9. Appeals

No appeals were received.

# **3502** Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

# Submission Specifications

**Description**: The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

- 1. Dataset used for development, some testing (see below for differences), and measure results:
  - a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
  - b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

**Numerator Statement**: The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

**Denominator Statement**: The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

Exclusions: The measure excludes index admissions for patients:

- 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
- 2. Discharged against medical advice (AMA);

- 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
- 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Adjustment/Stratification: Statistical risk model Level of Analysis: Facility Setting of Care: Inpatient/Hospital, Other Type of Measure: Outcome Data Source: Claims, Electronic Health Records, Other Measure Steward: Centers for Medicare & Medicaid Services (CMS)

# STANDING COMMITTEE MEETING 06/17/2019

# 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-17; No Pass-0; 1b. Performance Gap: H-1; M-17; L-0; I-0

Rationale:

- This is a new measure developed in sequence with measure 3504 (starting with measure 3504).
- This measure is aligned with measure 3504 but includes 10 additional risk adjusters captured from EHR data.
- This measure expands the target age to 50 to 94 years (from the 65 to 94 years range used in 3504.
- The developer provided several evidence-based strategies to reduce hospital mortality and shared that in the study cohort (4692 acute-care hospitals), the mean hospital-level risk standardized mortality rate (RSMR) was 6.85 and range was 3.95%-8.70%.
- Evidence and performance gap information for this measure is the same as measure 3504, therefore the Committee did not engage in further discussion related to "Importance".

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)

2a. Reliability: H-1; M-15; L-1; I-0; 2b. Validity: H-0; M-12; L-3; I-2

- This measure is deemed as complex and was evaluated by the NQF Scientific Methods Panel.
- The Standing Committee chose to vote on this measure for, both, reliability and validity.

# Rationale:

- This measure is deemed as complex and was evaluated and passed by the NQF Scientific Methods Panel, but the Committee engaged in some discussion regarding the scientific properties.
- The developer performed score-level reliability testing for the hybrid measure (ICC=0.78).
- The developer noted that they performed face validity for the hybrid measure (5 of 6 respondents indicated that they somewhat, moderately, or strongly agreed, and 1 moderately disagreed that the hybrid measure can be used to distinguish between better and worse quality

facilities) and tested the data element validity of the EHR elements. The measure was tested in a smaller set of 21 hospitals in one integrated delivery system.

- The developer stated that they tested the claims-based measure extensively and have no reason to believe this measure would be less valid. Empirical validity testing –correlation with nurse-to-bed ratio, hospital star rating mortality group score and overall hospital star rating showed a trend toward better performance on the measure with better performance on the comparators.
- There was a suggestion by a Committee member that the developer could look at the performance of the claims-only measure in the integrated delivery system (rather than only Medicare patients).
- The developer responded that they did look at the integrated delivery system data compared to the national data in terms of representativeness; the population was more similar to the U.S. Medicare population in rates of comorbidities than might be expected.
- There was conversation about missing lab values and how they are handled. The Committee suggested that the developer further examine the completeness of lab data when the measure is used more broadly.
- The developer was not able to test the hybrid measure for the impact of social factors due to the small testing sample but explained they do not have a reason to expect that testing would reveal different results than the claims-only measure related to disparities. The Committee accepted the rationale.
- The Standing Committee chose to vote on this measure for the reliability and validity criteria.

# 3. Feasibility: H-3; M-14; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented) Rationale:

<u>Rationale</u>:

• The Committee generally agreed that the 21 data points from claims and 10 clinical data elements are available in standardized fields and feasible.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

#### 4a. Use: Pass-17; No Pass-0 4b. Usability: H-0; M-15; L-0; I-2

Rationale:

- The Committee acknowledged the plan for the new measure to considered in the future in the Inpatient Quality Reporting Program.
- There was some discussion regarding the need for two measures the claims-based measure and the hybrid. The developer shared that depending on the program or the setting one measure may be preferred over the other for adoption.

#### 5. Related and Competing Measures

- The following measures are related but not competing:
  - o Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789)

- Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550)
- Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468)
- Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893)
- Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558)
- Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230)
- Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229)
- Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization
- o Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)
- AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)
- The developer notes the measures are harmonized to the extent possible and complimentary to one another.

# 6. Standing Committee Recommendation for Endorsement: Yes-16; No-1

#### 7. Public and Member Comment

 Two similar comments pertaining to both measure 3502 and measure 3504 were received from one commenter. The commenter expressed detailed concerns regarding various aspects of these measures. The commenter stated there is a lack of evidence to support the measure's focus, a lack of convincing validity testing, inadequate support for the risk-adjustment approach, and limited usefulness of results for quality improvement and accountability purposes.

Developer Response: We appreciate your comments and have addressed each of your concerns below, separately.

#### Death within 30 days as a hospital quality measure

The claims-only and hybrid Hospital-Wide Mortality (HWM) measures include deaths that occur within 30-days of hospital admission. This is consistent with CMS's condition- and procedure-specific mortality measures currently reported on Hospital Compare. The 30-day time frame is also supported by the input we have received from clinical experts, empirical analyses performed during the development of this measure, and the published literature.

From a clinical perspective, adverse events that occur within the immediate post-discharge timeframe are often attributable to the hospital stay. For example, a patient released from the hospital may experience dizziness while driving, from medication or anesthesia administered during the hospital stay, and experience a fatal car accident. Also, adverse events that occur 30

days post-discharge can be attributed to the hospital. For example, a patient given a diuretic at discharge may become dehydrated, leading to kidney failure and death. However, input we received from clinical experts suggested deaths beyond 30 days are seldom attributed to care received during the hospitalization and are more commonly attributed to underlying health or care received in other settings.

From an empirical data analysis perspective, during measure development we reviewed survival curves (for Medicare beneficiaries 65 years and older) up to 90 days following admission to evaluate the appropriateness of the 30-day time frame across the HWM cohort. We found that 30 days post-admission included the largest declines in mortality and therefore, was the most appropriate time frame to capture most post-hospitalization deaths.

The published literature indicates that existing condition- specific, 30-day mortality measures support targeted quality improvement work, and may have contributed to national declines in hospital mortality rates for measures conditions and/or procedures. Studies have shown that, for selected conditions and diagnoses, mortality within 30 days of hospital admission is related to quality of care and variable mortality rates across hospitals indicate opportunities for improvement.

Finally, we examined the published literature and found that older adults are more vulnerable to adverse health outcomes within 30 days of a hospital admission and that mortality can be influenced by hospital care and the early transition to the outpatient setting during this time. Based on the evidence discussed above, a 30-day measurement period is the most appropriate period to measure mortality in a hospital setting.

#### Validity testing

The measures' NQF submissions meet NQF's criteria for validity testing. In terms of face validity, five of six Technical Expert Panel (TEP) member respondents somewhat, moderately, or strongly agreed with the statement that the HWM measures as specified can be used to distinguish good from poor quality. NQF does not specify the number of experts that are required to assess the measures' validity.

New measures are only required to submit evidence for face validity, however we also provided empiric validity with this initial endorsement submission. We chose three quality measures (nurse to bed ratio, Overall Hospital Quality Star Ratings mortality measure group score, and Overall Hospital Quality Star Ratings), as comparator measures, and demonstrated a relationship with the HWM measure scores in the expected direction for each comparator measure. We did not evaluate CMS's Hospital-Wide Readmission (HWR) measure score as a comparator because such testing is not a requirement of NQF's consensus development process. We agree that once implemented, it is important to examine trends in complementary measures and expect to do so as part of endorsement maintenance, should this measure be endorsed. Examination of correlation in measures scores after implementation are an important feature of surveillance for unintended consequences and should be part of rigorous measure maintenance.

Identification and testing of social risk factors as supplementary to clinical risk factors

We agree that, in the risk-adjusted outcome measures, CMS first considers adjustment for clinical conditions and then examines additional risk imparted by social risk factors after the potential for greater disease burden is included in the risk model. We believe that this is consistent with NQF current guidance and is appropriate given the evidence cited in our submission that people who experience greater social risk are more likely to have more disease burden compared with those who do not; and that this is clearly not a signal of hospital quality. In addition, according to NQF guidance, developers should assess social risk factors for their contribution of unique variation in the outcome – that they are not redundant. Therefore, if clinical risk factors explain all or most of the patient variation in the outcome, then NQF guidance does not support adding social risk factors that do not account for variation.

An extensive set of analyses of the impact of including social risk variables in the risk adjustment model was included as part of the NQF application submitted for these measures' endorsements. For example, one analysis examined the strength and significance of the SES variables in the context of a bivariate model compared with a multivariable model. When these variables were included in a multivariate model that includes all the claims-based clinical variables, the odds ratios for both the dual eligible and AHRQ SES variables in the multivariate model are almost always lower than the odds ratio for the bivariate association. This indicates that the comorbid risk variables that are already in the model (in the multivariate view) are capturing the risk associated with the outcome seen in the bivariate analysis (with the social risk factor alone), and the dual eligible variable in a multivariate model would not play a significant role in the model (the coefficients/odds ratios are not different from 1). Additional analyses provided in the application also showed that correlation coefficients of measure scores comparing models with and without the social risk variables are near 1.0 and that C-statistics with the social risk variables in vs. out of the model, are unchanged.

#### Usefulness of the measures; variation in the measure score

Mortality is an important health outcome that is meaningful to patients and providers, and updated estimates suggest that more than 400,000 patients die each year from preventable harm in hospitals. The existing condition- and procedure-specific mortality measures have a narrow focus, only capturing specific patient populations, while the HWM measures capture most Medicare FFS beneficiaries.

The hospital-level variation in performance on the measure score for the claims-only HWM measure between the lowest-performing hospitals (risk-standardized mortality rate or RSMR of 3.95%) and the highest performing hospitals (RSMR of 8.7%) shows there is a clear quality gap. In terms of performance compared to the median (6.93%), some hospitals can achieve substantially lower overall risk-standardized mortality rates than the average-performing hospital, while other hospitals are performing substantially worse than an average performer. Specifically, the best performing hospital (RSMR of 3.95%) is performing 43% better than an average performer, while the worst performing hospital (RSMR of 8.70%) is performing 25% worse than an average performer. (Note that the average performer refers to hospital with the same case and service-line mix, performing at the average [median]).

In terms of outliers, in the updated ICD-10 version of the measure (which was submitted to NQF), using 95% confidence interval (uncertainty) estimates to categorize hospital outliers, there were 14 hospitals with performance that was statically significantly worse than the

national average, and 103 hospitals with performance that was statistically significantly better than the national average. In total, this measure identified 2.6% of hospitals as outliers, which is consistent with other CMS condition- and procedure-specific measures that display a range of 2.5% - 11.2% of hospitals as outliers. However, using 95% confidence interval (uncertainty) estimates to categorize hospital outliers is conservative by design. The distribution and mortality rates themselves (cited in the paragraph above), however, do convey meaningful variation. This variation provides a quality signal and we believe reporting hospital mortality scores will improve transparency and promote quality improvement.

The HWM measures were also designed to support quality improvement efforts. By providing a hospital-wide quality score, as well as division-level results, the measures give hospitals an overall evaluation of a hospital's performance on an important outcome and provides actionable information for quality improvement. Should CMS include the HWM measures in public reporting, consistent with other measures, hospitals would receive confidential, patient-level data for quality improvement, allowing for thorough investigation of patient scenarios that resulted in mortality. In addition, similar to CMS's HWR measure, confidential data and mortality results may be provided to all hospitals for each of the service-line divisions, allowing hospitals to identify service lines with greater mortality and target them for improvement.

Hospital-wide measures provide patients and consumers with an overall outcome score (in this case, mortality) for most acute care hospitals in the nation, including smaller, low volume hospitals without enough cases to publicly report scores for the condition- and procedure-specific measures.

# 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019) Decision: Approved for endorsement

#### 9. Appeals

No appeals were received.

#### 3503e Hospital Harm – Severe Hypoglycemia

#### Submission Specifications

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients aged 18 years and older who received at least one antihyperglycemic medication during their hospitalization, and who suffered a severe hypoglycemic event (blood glucose less than 40 mg/dL) within 24 hours of the administration of an antihyperglycemic agent.

**Numerator Statement**: The number of inpatient admissions during which a test for blood glucose with a result less than 40 mg/dL (severe hypoglycemia) where the event follows the administration of an antihyperglycemic medication within 24 hours.

**Denominator Statement**: All patients 18 years or older at the start of the encounter with a discharged inpatient hospital admission during the measurement period who were given at least one

antihyperglycemic medication during their hospital stay. The measure includes inpatient admissions which began in the Emergency Department or in observation status.

Exclusions: N/A, there are no denominator exclusions.

Adjustment/Stratification: There is no risk adjustment

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

**Data Source**: Electronic Health Records

Measure Steward: Centers for Medicare & Medicaid Services (CMS)

# STANDING COMMITTEE MEETING 06/17/2019

# 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-18; No Pass-0; 1b. Performance Gap: H-0; M-17; L-1; I-1

# Rationale:

• The goal of the Severe Hypoglycemia Electronic Clinical Quality Measure (eCQM) is to improve patient

safety and prevent severe hypoglycemia in patients who are at risk.

- The focus of this outcome measure is inpatient hypoglycemia. The purpose of measuring hypoglycemic events is to reduce the frequency of these adverse patient outcomes and to improve hospitals' practices for appropriate dosing of medication and adequate monitoring of patients receiving glycemic control agents.
- The Committee agreed that rates of inpatient hypoglycemic events can be reduced with high quality of care provided by a hospital and that severe hypoglycemic events are largely avoidable by careful use of antihyperglycemic medication, monitoring of patient blood glucose levels, enhanced use of technology, and implementation of evidence-based best practices.
- This eCQM was tested with 2 test sites (6 hospitals) in 2 states (located in Midwest, South).
- Performance rates on this measure were ~2.5%. The committee agreed there was variation in performance across the hospitals tested.

# **2.** Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)

• This measure is deemed as complex and was evaluated by the NQF Scientific Methods Panel

2a. NQF Scientific Methods Panel Ratings for Reliability: H-2; M-2; L-0; I-0

2b. NQF Scientific Methods Panel Ratings for Validity: H-1; M-3 L-1; I-0

# (The Committee accepted the NQF Scientific Methods Panel's Moderate rating, unanimously.) Rationale:

- This measure was deemed as complex and was evaluated by the NQF Scientific Methods Panel, who passed the measure.
- The committee accepted the NQF Scientific Methods Panel decision, unanimously.

#### 3. Feasibility: H-11; M-8; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

Rationale:

• The committee voted to accept the NQF Scientific Methods Panel's decision, which was to pass this measure. The Committee also discussed this measure's feasibility which was also tested as an eMeasure in two separate EHRs and had few concerns.

# 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

# 4a. Use: Pass-19; No Pass-0 4b. Usability: H-7; M-12; L-0; I-0

Rationale:

• There are also recommendations by the MAP to include this in public accountability programs through CMS, therefore the committee passed the measure on usability.

#### 5. Related and Competing Measures

• No related or competing measures noted.

#### 6. Standing Committee Recommendation for Endorsement: Yes-19; No-0

#### 7. Public and Member Comment

- Two comments were received for this measure. One commenter did not support the measure because it provides no clear guidance on the medications to be monitored or the types of glucose tests that would apply. Another commenter supported the measure's intent, but suggested additional work is needed before endorsement. The commenter highlighted MAP conversations around the need for a balancing measure to account for unintended consequences, expressed that additional feasibility and validity testing is needed, and stated that differences in scores may be minimal.
  - Developer Response: Thank you for your comment. This measure assesses the use of specific antihyperglycemic medications documented in the National Library of Medicine (NLM) Value Set Authority Center (VSAC) that can cause severe hypoglycemia. This measure considers both point-of-care test results and laboratory test results, which are also documented in the NLM VSAC.

Thank you for your comment. We recognize the importance of measuring hyperglycemia as a balancing measure in conjunction with hypoglycemia. We have submitted a balancing hyperglycemia measure to the NQF Patient Safety Standing Committee for the fall 2019 cycle, as well as the 2019-2020 Measures Under Consideration (MUC) list. We agree with the importance of continually monitoring for unintended consequences, and we intend to consider these comments when implementing these measures in the future.

We understand the value of sample size in measure testing and note that measure testing was done in compliance with NQF requirements for eCQM development. This measure was tested in two EHR systems that had good representation of hospitals across the country. This aligns with NQF's recommendation to conduct eCQM testing in more than one EHR system. The empirical results demonstrated that the measure exhibited high reliability and data element validity.

We also note that testing results demonstrated statistically significant variation in performance rates across the hospitals tested. This wide variation indicates that there exists ample room for improvement on this harm event.

8. Consensus Standards Approval Committee (CSAC) Vote: Yes-13; No-0 (10/21/2019) Decision: Approved for endorsement

#### 9. Appeals

No appeals were received.

# **3504** Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

#### Submission Specifications

**Description**: The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

- a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
- b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

**Numerator Statement**: The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

**Denominator Statement**: The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

Exclusions: The measure excludes index admissions for patients:

- 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
- 2. Discharged against medical advice (AMA);
- 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
- 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

Adjustment/Stratification: Statistical risk model

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital Type of Measure: Outcome Data Source: Claims, Enrollment Data, Other Measure Steward: Centers for Medicare & Medicaid Services (CMS)

# STANDING COMMITTEE MEETING 06/17/2019

1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-17; No Pass-0; 1b. Performance Gap: H-1; M-17; L-0; I-0 Rationale:

- This is a new measure developed in sequence with measure 3502 (starting with this measure).
- The Committee agreed that there are evidence-based strategies to decrease risk of hospital mortality and that there is a gap in mortality scores based on the range of mortality scores presented: 3.95 percent to 8.70 percent.
- The Committee asked about the upper age limit of 95 years, and the developer responded that mortality rate generally levels off after 95 years and they also used input from a TEP and a patient and caregiver group.

# 2. Scientific Acceptability of Measure Properties: <u>The measure meets the Scientific Acceptability</u> <u>criteria</u>

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)

- This measure is deemed as complex and was evaluated by the NQF Scientific Methods Panel
- 2a. NQF Scientific Methods Panel Ratings for Reliability: H-3; M-2; L-0; I-0

2b. NQF Scientific Methods Panel Ratings for Validity: H-3; M-2 L-0; I-0

# (The Committee accepted the NQF Scientific Methods Panel's Moderate/High ratings, unanimously.) Rationale:

- The Committee accepted the SMP's passing ratings of reliability and validity.
- Testing included score-level reliability (ICC=0.84).
- Face validity results were that 5 out of 6 respondents indicated that they somewhat, moderately, or strongly agreed, and 1 moderately disagreed that the claims-based measure can be used to distinguish between better and worse quality facilities.
- Empirical validity testing –correlation with nurse-to-bed ratio, hospital star rating mortality group score and overall hospital star rating showed a trend toward better performance on the measure with better performance on the comparators.
- There was discussion about patients that come into the hospital in a fragile state, at the end of life, or with a complication from lack of quality care outside of the hospital and how complications prior to the visit but not associated with a present-on-admission code impact the measure. The Committee generally agreed with the developer's response that they use a validated algorithm, representing the risk adjustment model, that captures inpatient claims data from the prior 12 months and that they wanted to recognize the opportunity for hospitals that do rescue.

• The developer uses a risk-adjustment model with 21 variables, not including dual eligibility or AHRQ SES Index based on testing results showing very limited impact of these factors on the adjustment model.

#### 3. Feasibility: H-4; M-14; L-0; I-0

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

# Rationale:

• The Committee agreed the measure is feasible based on the use of claims data.

# 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

# 4a. Use: Pass-18; No Pass-0 4b. Usability: H-1; M-16; L-0; I-1

Rationale:

- The Committee acknowledge the plan for the new measure to considered in the future in the Inpatient Quality Reporting Program.
- The developer explained that 3504 and 3502 are aligned besides the addition of validated EHR risk variables to the hybrid measure to enhance claims-only risk adjustment. The developer explained that one or the other could be adopted depending on the program and setting.
- Regarding use and usability, there was some concern that hospitals not chosen for the measure that served patients who had multiple hospitalizations are not able to see or understand results of the quality of care they provided. The developer stated that patients being admitted repeatedly represent only a small portion of the total measured population and that the measure is complementary to the readmissions measure; admissions not selected as part of the mortality measure may be captured in the readmissions measure, if a readmission occurred.

#### 5. Related and Competing Measures

- This measure is related to the following measures:
  - o NQF 1789: Hospital-Wide All-Cause Risk-Standardized Readmission Measure
  - NQF 1550: Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA
  - NQF 0468: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization
  - NQF 1893: Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization
  - NQF 2558: Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery
  - NQF 0230: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
  - NQF 0229: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

- NQF 0347: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization. Death Rate in Low Mortality Diagnosis Related Groups (PSI-02)
- o NQF 0530: AHRQ's Mortality for Select Conditions
- The developer states specification differences are justified.

#### 6. Standing Committee Recommendation for Endorsement: Yes-17; No-1

#### 7. Public and Member Comment

- Two similar comments pertaining to both measure 3502 and measure 3504 were received from one commenter. The commenter expressed detailed concerns regarding various aspects of these measures. The commenter stated there is a lack of evidence to support the measure's focus, a lack of convincing validity testing, inadequate support for the risk-adjustment approach, and limited usefulness of results for quality improvement and accountability purposes.
  - Developer Response: We appreciate your comments and have addressed each of your concerns below, separately.

#### Death within 30 days as a hospital quality measure

The claims-only and hybrid Hospital-Wide Mortality (HWM) measures include deaths that occur within 30-days of hospital admission. This is consistent with CMS's conditionand procedure-specific mortality measures currently reported on Hospital Compare. The 30-day time frame is also supported by the input we have received from clinical experts, empirical analyses performed during the development of this measure, and the published literature.

From a clinical perspective, adverse events that occur within the immediate postdischarge timeframe are often attributable to the hospital stay. For example, a patient released from the hospital may experience dizziness while driving, from medication or anesthesia administered during the hospital stay, and experience a fatal car accident. Also, adverse events that occur 30 days post-discharge can be attributed to the hospital. For example, a patient given a diuretic at discharge may become dehydrated, leading to kidney failure and death. However, input we received from clinical experts suggested deaths beyond 30 days are seldom attributed to care received during the hospitalization and are more commonly attributed to underlying health or care received in other settings.

From an empirical data analysis perspective, during measure development we reviewed survival curves (for Medicare beneficiaries 65 years and older) up to 90 days following admission to evaluate the appropriateness of the 30-day time frame across the HWM cohort. We found that 30 days post-admission included the largest declines in mortality and therefore, was the most appropriate time frame to capture most posthospitalization deaths.

The published literature indicates that existing condition- specific, 30-day mortality measures support targeted quality improvement work, and may have contributed to national declines in hospital mortality rates for measures conditions and/or procedures. Studies have shown that, for selected conditions and diagnoses, mortality within 30 days of hospital admission is related to quality of care and variable mortality rates across hospitals indicate opportunities for improvement.

Finally, we examined the published literature and found that older adults are more vulnerable to adverse health outcomes within 30 days of a hospital admission and that mortality can be influenced by hospital care and the early transition to the outpatient setting during this time. Based on the evidence discussed above, a 30-day measurement period is the most appropriate period to measure mortality in a hospital setting.

#### Validity testing

The measures' NQF submissions meet NQF's criteria for validity testing. In terms of face validity, five of six Technical Expert Panel (TEP) member respondents somewhat, moderately, or strongly agreed with the statement that the HWM measures as specified can be used to distinguish good from poor quality. NQF does not specify the number of experts that are required to assess the measures' validity.

New measures are only required to submit evidence for face validity, however we also provided empiric validity with this initial endorsement submission. We chose three quality measures (nurse to bed ratio, Overall Hospital Quality Star Ratings mortality measure group score, and Overall Hospital Quality Star Ratings), as comparator measures, and demonstrated a relationship with the HWM measure scores in the expected direction for each comparator measure. We did not evaluate CMS's Hospital-Wide Readmission (HWR) measure score as a comparator because such testing is not a requirement of NQF's consensus development process. We agree that once implemented, it is important to examine trends in complementary measures and expect to do so as part of endorsement maintenance, should this measure be endorsed. Examination of correlation in measures scores after implementation are an important feature of surveillance for unintended consequences and should be part of rigorous measure maintenance.

#### Identification and testing of social risk factors as supplementary to clinical risk factors

We agree that, in the risk-adjusted outcome measures, CMS first considers adjustment for clinical conditions and then examines additional risk imparted by social risk factors after the potential for greater disease burden is included in the risk model. We believe that this is consistent with NQF current guidance and is appropriate given the evidence cited in our submission that people who experience greater social risk are more likely to have more disease burden compared with those who do not; and that this is clearly not a signal of hospital quality. In addition, according to NQF guidance, developers should assess social risk factors for their contribution of unique variation in the outcome – that they are not redundant. Therefore, if clinical risk factors explain all or most of the

patient variation in the outcome, then NQF guidance does not support adding social risk factors that do not account for variation.

An extensive set of analyses of the impact of including social risk variables in the risk adjustment model was included as part of the NQF application submitted for these measures' endorsements. For example, one analysis examined the strength and significance of the SES variables in the context of a bivariate model compared with a multivariable model. When these variables were included in a multivariate model that includes all the claims-based clinical variables, the odds ratios for both the dual eligible and AHRQ SES variables in the multivariate model are almost always lower than the odds ratio for the bivariate association. This indicates that the comorbid risk variables that are already in the model (in the multivariate view) are capturing the risk associated with the outcome seen in the bivariate analysis (with the social risk factor alone), and the dual eligible variable in a multivariate model would not play a significant role in the model (the coefficients/odds ratios are not different from 1). Additional analyses provided in the application also showed that correlation coefficients of measure scores comparing models with and without the social risk variables are near 1.0 and that Cstatistics with the social risk variables in vs. out of the model, are unchanged.

#### Usefulness of the measures; variation in the measure score

Mortality is an important health outcome that is meaningful to patients and providers, and updated estimates suggest that more than 400,000 patients die each year from preventable harm in hospitals. The existing condition- and procedure-specific mortality measures have a narrow focus, only capturing specific patient populations, while the HWM measures capture most Medicare FFS beneficiaries.

The hospital-level variation in performance on the measure score for the claims-only HWM measure between the lowest-performing hospitals (risk-standardized mortality rate or RSMR of 3.95%) and the highest performing hospitals (RSMR of 8.7%) shows there is a clear quality gap. In terms of performance compared to the median (6.93%), some hospitals can achieve substantially lower overall risk-standardized mortality rates than the average-performing hospital, while other hospitals are performing substantially worse than an average performer. Specifically, the best performing hospital (RSMR of 3.95%) is performing 43% better than an average performer, while the worst performing hospital (RSMR of 8.70%) is performing 25% worse than an average performer. (Note that the average performer refers to hospital with the same case and service-line mix, performing at the average [median]).

In terms of outliers, in the updated ICD-10 version of the measure (which was submitted to NQF), using 95% confidence interval (uncertainty) estimates to categorize hospital outliers, there were 14 hospitals with performance that was statically significantly worse than the national average, and 103 hospitals with performance that was statistically significantly better than the national average. In total, this measure identified 2.6% of hospitals as outliers, which is consistent with other CMS condition- and procedure-specific measures that display a range of 2.5% - 11.2% of hospitals as outliers. However, using 95% confidence interval (uncertainty) estimates to categorize hospital outliers is conservative by design. The distribution and mortality rates themselves (cited in the

paragraph above), however, do convey meaningful variation. This variation provides a quality signal and we believe reporting hospital mortality scores will improve transparency and promote quality improvement.

The HWM measures were also designed to support quality improvement efforts. By providing a hospital-wide quality score, as well as division-level results, the measures give hospitals an overall evaluation of a hospital's performance on an important outcome and provides actionable information for quality improvement. Should CMS include the HWM measures in public reporting, consistent with other measures, hospitals would receive confidential, patient-level data for quality improvement, allowing for thorough investigation of patient scenarios that resulted in mortality. In addition, similar to CMS's HWR measure, confidential data and mortality results may be provided to all hospitals for each of the service-line divisions, allowing hospitals to identify service lines with greater mortality and target them for improvement.

Hospital-wide measures provide patients and consumers with an overall outcome score (in this case, mortality) for most acute care hospitals in the nation, including smaller, low volume hospitals without enough cases to publicly report scores for the conditionand procedure-specific measures.

# 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-14; No-0 (10/21/2019) Decision: Approved for endorsement

#### 9. Appeals

No appeals were received.

# Measure Not Endorsed

# 3501e Hospital Harm – Opioid-Related Adverse Events

#### **Submission**

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients age 18 years and older who suffer the harm of receiving an excess of hospital-administered opioids, defined as receiving a narcotic antagonist (naloxone). In the first 24 hours of the hospitalization, a hospital-administered opioid must be documented prior to receiving naloxone to be considered part of the numerator.

**Numerator Statement**: The number of inpatient admissions during which naloxone is administered as a proxy for administration of excessive amounts of opioid medications, not including naloxone given while in the operating room. In the first 24 hours of the hospitalization, an opioid must have been administered prior to receiving naloxone to be considered part of the outcome.

**Denominator Statement**: All patients 18 years or older at the start of the encounter with a discharged inpatient hospital admission during the measurement period. The measure includes inpatient admissions which began in the Emergency Department or in observational status.

Exclusions: N/A; there are no denominator exclusions

Adjustment/Stratification: There is no risk stratification.

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

Data Source: Electronic Health Records

Measure Steward: Centers for Medicare & Medicaid Services

#### STANDING COMMITTEE MEETING 06/17/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

1a. Evidence: Pass-18; No Pass-1; 1b. Performance Gap: H-1; M-5; L-4; I-9

<u>Rationale</u>:

- The Committee did think that there were one or more healthcare actions that could lower the risk of naloxone being necessary, particularly actions that would lower the use of opioids in the hospital.
- However, the measure did not pass the Performance Gap criterion—a must-pass criterion.
- There were several concerns that were raised with this measure by the Committee. First was whether naloxone use is a good quality measure.
- There was concern that naloxone can be used empirically in patients with changed sensorium, so it does not necessarily indicate that there was an opioid overdose. In addition, there were concerns that sometimes naloxone may be used to reverse opioids as part of a plan of care and that the measure may cause providers to be more reluctant to give naloxone when it's needed.

- There were also concerns about how the measure was specified as a proportion of all adult patients dischared from the hospital as opposed to those who received opioids– and how the propensity to use narcotics by a hospital might change performance rates.
- There were also issues in the measure testing because there are variable places in the EHR where narcotics are documented: in the Medication Administration Record (MAR) or within procedure notes.
- In addition, there were concerns that the actual rate of occurrence was relatively low in measure testing and did not have a large enough measure gap to justify measurement. For these reasons, this measure did not pass performance gap and discussion and voting on the remaining criteria stopped.

#### 2. Scientific Acceptability of Measure Properties:

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity
 2a. Reliability: N/A
 <u>Rationale</u>:

#### 3. Feasibility: N/A

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented) Rationale:

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

4a. Use: **N/A** 4b. Usability: **N/A** <u>Rationale</u>:

#### 5. Related and Competing Measures

N/A

#### 6. Standing Committee Recommendation for Endorsement: N/A

<u>Rationale</u>

• The Committee did not vote on this measure because it did not pass Performance Gap, which is a Must Pass criterion.

#### 7. Public and Member Comment

• Two comments were received for this measure. One commenter agreed with the Committee's decision not to recommend this measure for endorsement citing the lack of score variation to support a performance gap and the potential for the measure to misrepresent hospital performance. Another commenter offered recommendations: clarify the measure rate is not

expected to be zero, exclude patients with cancer or palliative care, and also exclude patients for which naloxone is administered for suspected overdose but later found to be unrelated to opioid harm.

 Developer Comments: Thank you for your comment. The measure steward will consider what changes, if any, should be incorporated into this important measure for future use. We, however, note that testing results showed statistically significant variation in performance rates across the hospitals tested. The wide variation suggests there exists ample room for improvement on this harm event.

Thank you for your comment. The intent of this measure is not to reduce clinically appropriate use of naloxone nor to bring the measure rate to zero, but to identify if hospitals have particularly high rates of naloxone use as an indicator of high rates of over-administration of opioids in the inpatient setting, thereby incentivizing improved clinical practices. Proper dosing of opioids and monitoring of patients on opioids can reduce the need for naloxone use in patient care. We thank the commenter's suggestion for the potential refinement specific to the exclusion criteria. We will take this suggestion under consideration as we review consider what changes, if any, should be incorporated into this important measure for future use.

# 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-0; No-13 (10/21/2019) Decision: Not approved for endorsement

#### 9. Appeals

This measure did not move forward to appeals period.

# Measure Withdrawn From Consideration

# 3498e Hospital Harm - Pressure Injury

# Submission Specifications

**Description**: This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients ages 18 years and older who develop a new stage 2, stage 3, stage 4 pressure injury, deep tissue pressure injury, or unstageable pressure injury during hospitalization.

**Numerator Statement**: The number of hospital inpatient admissions during which a patient developed a new stage 2, stage 3, stage 4 pressure injury, deep tissue pressure injury, or unstageable pressure injury that was not documented as present in the first 24 hours of hospital arrival.

**Denominator Statement**: All patients 18 years or older at the start of the encounter and discharged inpatient hospital admission during the measurement period. The measure includes inpatient admissions which began in the Emergency Department or in observational status.

Exclusions: There are no denominator exclusions.

Adjustment/Stratification: No risk adjustment or stratification

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

Data Source: Electronic Health Records

Measure Steward: Centers for Medicare and Medicaid Services (CMS)

# STANDING COMMITTEE MEETING 06/17/2019

#### 1. Importance to Measure and Report: The measure meets the Importance criteria

(1a. Evidence, 1b. Performance Gap)

# 1a. Evidence: Pass-19; No Pass-0. Performance Gap: H-1; M-17; L-0; I-1

Rationale:

• The goal of the Pressure Injury Electronic Clinical Quality Measure (eCQM) is to improve patient safety

and prevent patients from acquiring a new pressure injury during their hospitalization. Pressure injuries, also called pressure ulcers, bed sores, or decubitus ulcers, are serious events and one of the most common patient harms.

- The committee agreed that pressure ulcers can be reduced using best practices including frequent repositioning, proper skin care, and specialized cushions or beds.
- The measure was tested in three sites (24 hospitals) across 3 separate EHR systems. Performance rates were all <1% for hospitals and there was variation in performance across sites.

# **2.** Scientific Acceptability of Measure Properties: The measure meets the Scientific Acceptability criteria

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity) 2a. Reliability: **H-2**; **M-16**; **L-0**; **I-1**; 2b. Validity: **H-0**; **M-17**; **L-2**; **I-0** 

# NATIONAL QUALITY FORUM

- This measure is deemed as complex and was evaluated by the NQF Scientific Methods Panel.
- The Standing Committee chose to vote on this measure for, both, reliability and validity.

# Rationale:

- This measure was assessed by the Scientific Methods Panel.
- There were some concerns raised in the Methods Panel review as below; however, the committee choose to accept the overall assessment of the methods panel to pass the measure on Scientific Acceptability.
- In reliability testing, the PPV was high in two of the four datasets tested (98% and 97%) but lower in two tested (69% and 45%), which were explained as documentation errors.
- There was concern by the Methods Panel because of the lack of risk adjustment.
- There was also concern that inconsistent use of structured fields by hospitals may influence the measure score.

# 3. Feasibility: H-0; M-13; L-5; I-1

(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/ unintended consequences identified 3d. Data collection strategy can be implemented)

# Rationale:

- There were some challenges in the feasibility testing of the eMeasure which were discussed by the committee, particularly the variability in where the information was documented in structured fields in one of the EHRs to document data for the measure.
- As a result of this discussion, there were some concerns by the Committee about feasibility, particularly integrating this measure across multiple EHRs that may not have structured fields to capture pressure ulcer data in a standardized way.

#### 4. Use and Usability

4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)

# 4a. Use: Pass-19; No Pass-0 4b. Usability: H-3; M-15; L-1; I-0

Rationale:

• Regarding usability, the developer stated that the MAP had recommended inclusion in an accountability program pending feedback from the Committee. Therefore, there were no concerns about usability.

#### 5. Related and Competing Measures

- Hospital-acquired pressure injuries are currently measured and publicly reported in the Hospital-Acquired Condition Reduction Program (HACRP) as a component of the Patient Safety Indicator (PSI) 90 measure, which relies on ICD codes as a data source.
- Related: Additionally, the following NQF endorsed measures are related but measure different patient populations: Percent of High Risk Residents with Pressure Ulcers (Long Stay) (NQF #0679) and Percent of Residents or Patients with Pressure Ulcers that are New or Worsened (Short Stay) (NQF #0678).

# 6. Standing Committee Recommendation for Endorsement: Yes-19; No-0 (Withdrawn from Consideration)

<u>Rationale</u>

- The Standing Committee recommended the measure for NQF endorsement. Overall, the Committee believed that despite concerns with the feasibility across multiple EHRs that this was a good outcome measure for quality of care, and that it was a reliable and valid as specified by the developer. The standing committee noted that while there are several pressure ulcer measures in the NQF portfolio, this was the first that was submitted as an eMeasure.
- However, following the September 18 Committee Post-Comment call, the developer for this measure notified NQF that they are withdrawing the measure from consideration due to substantive anticipated changes. This is measure is withdrawn from consideration at this time.

#### 7. Public and Member Comment

• Two commenters supported the measure's intent, but suggested additional work is needed before endorsement. One commenter referenced the Measure Application Partnership's (MAP) discussions around the need to consider additional exclusions. The commenter also expressed concern regarding the ability to capture pressure injury staging in the electronic health record (EHR) and was not convinced there are meaningful differences in performance scores. Another commenter also was concerned about the lack of standardization around pressure injury documentation. Also referenced was the need for consistency around who determines staging and the length of time for considering an injury hospital-acquired.

Developer Response: Thank you for your comment. We understand that the MAP has expressed broad support for the measure and agreed that the measure can reduce patient harm caused by pressure injury. As the commenter pointed out, the MAP has also suggested that the measure may need to exclude certain types of patients. MAP's suggestion was taken into account during measure testing. Based on the evidence gathered during testing and from expert input, the measure does not exclude patients with certain conditions from the denominator. Evidence suggests most newly acquired pressure injuries can be prevented through best practices that are customized to the patient's risk. The most common causes of pressure injuries (limited mobility during acute illness, friction against skin) put all hospitalized patients at similar risk [1][2]. Overall, this measure aims to be as inclusive as possible to ensure the most impact on the safety of all patients.

The information required for this eCQM is collected during routine patient assessment in accordance with national clinical guidelines. During measure development and testing, we noted that the eCQM requirement for documentation in discrete fields resulted in a need to adjust clinical workflow in some hospitals, but this was offset by the benefit of capturing accurate information from which to drive quality improvement efforts. Documentation is an important component of the quality signal as hospitals cannot measure what is not documented.

We note that measure testing was done in compliance with NQF requirements for eCQM development, including NQF's recommendation to conduct eCQM testing in more than one EHR

system. The empirical results demonstrated that the measure exhibited high reliability and data element validity.

Lastly, we understand the commenter's concern about the measure's performance rates. We, however, note that the wide variation of rates across hospitals indicates that there is ample room for improvement with this serious harm event.

[1] Gunningberg, L., Donaldson, N., Aydin, C., Idvall, E. (2011). Exploring variation in pressure ulcer prevalence in Sweden and the USA: Benchmarking in action. 18. 10.1111/j.1365-2753.2011.01702.x. Journal of evaluation in clinical practice, 904-910.

[2] Berlowitz, D., VanDeusen Lukas, C., Parker, V., Niederhauser, A., Silver, J., Logan, C., Ayello, E., Zulkowski, K. (2012). Preventing Pressure Ulcers in Hospitals-A Toolkit for Improving Quality of Care.

Developer Response: Thank you for your comment. We understand that clinician variability in documenting stages of pressure injuries can present challenges. We clarify that the measure numerator includes all new hospital-acquired pressure injuries stage 2-4, unstageable pressure injuries, and deep tissue pressure injuries. The measure, as specified, does not discriminate by stage and does not penalize hospitals based on variability in clinician staging of pressure injuries.

#### 8. Consensus Standards Approval Committee (CSAC) Vote: Yes-X; No-X

• Following the September 18 Committee Post-Comment call, the developer for new measure #3498e Hospital Harm – Pressure Injury notified NQF that they are withdrawing the measure for consideration due to anticipated substantive changes. This measure did not move forward to CSAC.

#### 9. Appeals

This measure did not move forward to appeals period.

NQF #	Title	Federal Programs: Implemented or Finalized
0022	Use of High Risk Medications in the Elderly	Merit-Based Incentive Payment System (MIPS) Program (Finalized 2016)
0097	Medication Reconciliation Post-Discharge	Merit-Based Incentive Payment System (MIPS) Program (Finalized 2016)
		Physician Compare (Implemented 2007)
0101	Falls: Screening for Future Fall Risk	Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018)
		Shared Savings Program (Implemented 2012)
0138	National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure	Hospital Acquired Condition Reduction Program (Implemented 2014)
		Inpatient Rehabilitation Facility Quality Reporting (Implemented 2014)
		Hospital Inpatient Quality Reporting (Implemented 2013/Scheduled Removal 2021)
		Long-Term Care Hospital Quality Reporting (Implemented 2013)
		Prospective Payment System-Exempt Cancer Hospital Quality Reporting (Implemented 2013)
0139	National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure	Hospital Acquired Condition Reduction Program (Implemented 2014)
		Hospital Inpatient Quality Reporting (Implemented 2013/Scheduled Removal 2021)
		Long-Term Care Hospital Quality Reporting (Implemented 2013)
		Prospective Payment System-Exempt Cancer Hospital Quality Reporting (Implemented 2013)
0468	Hospital 30-Day, All-Cause, Risk-	Hospital Compare (Implemented 2010)
	Standardized Mortality Rate (RSMR) Following Pneumonia Hospitalization	Hospital Inpatient Quality Reporting (Implemented 2010/Scheduled Removal 2020)
		Hospital Value Base Purchasing (Implemented 2014)
0500	Severe Sepsis and Septic Shock: Management Bundle	Hospital Compare (Implemented 2016)
		Hospital Inpatient Quality Reporting (Implemented 2016)
0513	Thorax CT—Use of Contrast Material	Hospital Compare (Implemented 2014)
		Hospital Outpatient Quality Reporting (Implemented 2014/Scheduled Removal 2021)

<sup>&</sup>lt;sup>a</sup> Per CMS Measures Inventory Tool as of 1/16/2020

NQF #	Title	Federal Programs: Implemented or Finalized
0531	PSI 90: Patient Safety and Adverse Events Composite (Composite Measure)	Hospital Acquired Condition Reduction Program (Implemented 2017) Hospital Compare (Implemented 2014) Hospital Value Base Purchasing (Removed 2018/ new version to be implemented 2023) 2013)
0553	Care for Older Adults (COA) – Medication Review	Medicare Part C Star Rating (Implemented 2017)
0674	Percent of Residents Experiencing One or More Falls with Major Injury (Long Stay)	Nursing Home Quality Initiative (Implemented 2017)
0679	Percent of High Risk Residents with Pressure Ulcers (Long Stay)	Nursing Home Quality Initiative (Implemented 2017)
0684	Percent of Residents with a Urinary Tract Infection (Long-Stay)	Nursing Home Quality Initiative (Implemented 2017)
0686	Percent of Residents Who Have/Had a Catheter Inserted and Left in Their Bladder (long stay)	Nursing Home Quality Initiative (Implemented 2017)
0687	Percent of Residents Who Were Physically Restrained (Long Stay)	Nursing Home Quality Initiative (Implemented 2017)
0689	Percent of Residents Who Lose Too Much Weight (Long-Stay)	Nursing Home Quality Initiative (Implemented 2017)
0733	Operative Mortality Stratified by the Five STS-EACTS Mortality Categories	Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018/Scheduled for removal 2021))
0753	American College of Surgeons – Centers for Disease Control and Prevention (ACS-CDC) Harmonized Procedure Specific Surgical Site Infection (SSI) Outcome Measure	Hospital Compare (Implemented 2016) Hospital Value Base Purchasing (Implemented 2016) Hospital Acquired Condition Reduction Program (Implemented 2015) Hospital Inpatient Quality Reporting (Implemented 2015/Scheduled Removal 2021) Prospective Payment System-Exempt Cancer
1365	Child and Adolescent Major Depressive Disorder (MDD): Suicide Risk Assessment	Hospital Quality Reporting (Implemented 2014) Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018)
1365e	Child and Adolescent Major Depressive Disorder (MDD): Suicide Risk Assessment	Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018)
1463	Standardized Hospitalization Ratio for Admissions	End-Stage Renal Disease Quality Incentive Program (Finalized 2016)
1523	Rate of Open Repair of Small or Moderate Abdominal Aortic Aneurysms (AAA) Where Patients Are Discharged Alive	Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018/Scheduled for removal 2021)

NQF #	Title	Federal Programs: Implemented or Finalized
1716	National Healthcare Safety Network (NHSN) Facility-wide Inpatient Hospital- onset Methicillin-resistant Staphylococcus aureus (MRSA) Bacteremia Outcome Measure	Hospital Acquired Condition Reduction Program (Implemented 2016) Hospital Compare (Implemented 2016)
		Hospital Inpatient Quality Reporting (Implemented 2014/Scheduled Removal 2021)
		Hospital Value Base Purchasing (Implemented 2016)
		Prospective Payment System-Exempt Cancer Hospital Quality Reporting (Implemented 2017)
1717	National Healthcare Safety Network (NHSN) Facility-wide Inpatient Hospital- onset Clostridium difficile Infection (CDI) Outcome Measure	Hospital Acquired Condition Reduction Program (Implemented 2016)
		Hospital Compare (Implemented 2016)
		Hospital Inpatient Quality Reporting (Implemented 2014/Scheduled Removal 2021)
		Hospital Value Base Purchasing (Implemented 2016)
		Prospective Payment System-Exempt Cancer Hospital Quality Reporting (Implemented 2017)
		Long-Term Care Hospital Quality Reporting (Implemented 2016)
		Inpatient Rehabilitation Facility Quality Reporting (Implemented 2016)
1893	Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD)	Hospital Compare (Implemented 2015)
		Hospital Inpatient Quality Reporting (Implemented 2015/Scheduled Removal 2020)
		Hospital Value Base Purchasing (Implemented 2015/Scheduled for Implementation 2020)
2726	Prevention of Central Venous Catheter (CVC)-Related Bloodstream Infections	Merit-Based Incentive Payment System (MIPS) Program (Implemented 2018)
2940	Use of Opioids at High Dosage in Persons Without Cancer	Medicaid (Implemented 2016)
2988	Medication Reconciliation for Patients Receiving Care at Dialysis Facilities	End-Stage Renal Disease Quality Incentive Program (Finalized 2018/Scheduled Implementation 2022)

# **Appendix C: Patient Safety Standing Committee and NQF Staff**

# **STANDING COMMITTEE**

# Ed Septimus, MD (Co-chair)

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# **Appendix D: Measure Specifications**

# 0138 National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## STEWARD

Centers for Disease Control and Prevention

## DESCRIPTION

Standardized Infection Ratio (SIR) of healthcare-associated, catheter-associated urinary tract infections (UTI) will be calculated among patients in bedded inpatient care locations, except level II or level III neonatal intensive care units (NICU).

This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavior health hospitals.

# түре

Outcome

#### DATA SOURCE

Electronic Health Data, Electronic Health Records, Other, Paper Medical Records NHSN Urinary Tract Infection form; NHSN Denominators for Intensive Care Unit (ICU)/Other Locations (not NICU or SCA) form; NHSN Denominators for Specialty Care Areas/Oncology form.

## LEVEL

Facility, Other, Population : Regional and State

# SETTING

Inpatient/Hospital, Other, Post-Acute Care Oncology hospital

#### NUMERATOR STATEMENT

Total number of observed healthcare-associated CAUTI among patients in bedded inpatient care locations (excluding patients in Level II or III neonatal ICUs).

# NUMERATOR DETAILS

1. Definition of Infection that is Present on Admission (POA): An infection where all of the elements of an infection definition are present during the two calendar days before the day of admission, the first day of admission (day 1) and/or the day after admission (day 2) and are documented in the medical chart. Infections that are POA should not be reported as healthcare-associated infections (HAI) and are not reported as CAUTI. Symptoms must be documented in the chart by a healthcare professional during the POA time frame (e.g., nursing home documents fever prior to arrival to the hospital, patient reports fever >38.0°C). Physician diagnosis alone cannot be accepted as evidence of a urinary tract infection that is POA.

2. Definition of Healthcare-associated Infection (HAI): Any infection reported to NHSN must meet the definition of an NHSN HAI, that is, a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility. An infection is considered an HAI if the date of event of the

NHSN site-specific infection criterion occurs on or after the 3rd calendar day of admission to an inpatient location where day of admission is calendar day 1. All elements of the site-specific infection criterion must occur during the infection window period.

3. Definition of Infection Window Period: The NHSN Infection Window Period is defined as the 7-days during which all site-specific infection criteria must be met. It includes the day the first positive diagnostic test that is an element of the site-specific infection criterion, was obtained, the 3 calendar days before and the 3 calendar days after.

4. Definition of CAUTI: A UTI (either a Symptomatic Urinary Tract Infection [SUTI], or an asymptomatic bacteremic urinary tract infection [ABUTI]) where an indwelling urinary catheter was in place for more than 2 consecutive days in an inpatient location on the date of event, with day of device placement being Day 1, AND an indwelling urinary catheter was in place for more than 2 consecutive days in an inpatient of event was in place for more than 2 consecutive days of device placement before. If an indwelling urinary catheter was in place for more than 2 consecutive days in an inpatient location and then removed, the UTI date of event must be the day of discontinuation or the next calendar day to be catheter-associated.

5. Definition of indwelling catheter: A drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a drainage bag (including leg bags). These devices are also called Foley catheters. Condom or straight in-and-out catheters are not included nor are nephrostomy tubes or suprapubic catheters unless a indwelling urinary catheter is also present. Indwelling urethral catheters that are used for intermittent or continuous irrigation are included in CAUTI surveillance.

6. NHSN UTI criteria: Symptomatic Urinary Tract Infection criteria or Asymptomatic Bacteremic Urinary Tract Infection criteria. See below:

A Symptomatic Urinary Tract Infection (SUTI) that is catheter associated must meet A) or B) below:

A) Patient must meet 1, 2, and 3 below:

1. Patient had an indwelling urinary catheter that had been in place for more than 2 consecutive days as an inpatient on the date of event (day of device placement = Day 1) AND was either:

Present for any portion of the calendar day on the date of event<sup>+</sup>,

OR

Removed the day before the date of event‡

2. Patient has at least one of the following signs or symptoms:

• fever (>38.0°C) (To use fever in a patient > 65 years of age, the IUC needs to be in place for more than 2 consecutive days in an inpatient location on date of event and is either still in place OR was removed the day before the DOE.)

- suprapubic tenderness\*
- costovertebral angle pain or tenderness\*
- urinary urgency ^
- urinary frequency ^
- dysuria ^

3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of =105 CFU/ml (See Comments). All elements of the UTI criterion must occur during the Infection Window Period (See Definition Chapter 2 Identifying HAIs in NHSN).

<sup>+</sup> When entering event into NHSN choose "INPLACE" for Risk Factor for Urinary Catheter

‡ When entering event into NHSN choose "REMOVE" for Risk Factor for Urinary Catheter

\*With no other recognized cause (see Comments)

^ These symptoms cannot be used when catheter is in place. An indwelling urinary catheter in place could cause patient complaints of "frequency" "urgency" or "dysuria".

B) Patient must meet 1, 2, and 3 below:

- 1. Patient is =1 year of age
- 2. Patient has at least one of the following signs or symptoms:
  - fever (>38.0°C)
  - hypothermia (<36.0°C)
  - apnea\*
  - bradycardia\*
  - lethargy\*
  - vomiting\*
  - suprapubic tenderness\*

3. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacterium of =105 CFU/ml. All elements of the SUTI criterion must occur during the Infection Window Period

\*With no other recognized cause

<sup>‡</sup> If patient had an indwelling urinary catheter in place for more than 2 consecutive days in an inpatient location, and catheter was in place on the date of event or the previous day the CAUTI criterion is met. If no such indwelling urinary catheter was in place, UTI (non-catheter associated) criterion is met.

Note: Fever and hypothermia are non-specific symptoms of infection and cannot be excluded from UTI determination because they are clinically deemed due to another recognized cause.

An Asymptomatic Bacteremic Urinary Tract Infection (ABUTI) that is catheter associated must meet the following:

Patient must meet 1, 2, and 3 below:

1. Patient has no signs or symptoms of SUTI 1 or 2 according to age

2.Patient has a urine culture with no more than two species of organisms, at least one of which is a bacterium of =105 CFU/ml

3.Patient has organism identified\*\* from blood specimen with at least one matching bacterium to the bacterium identified in the urine specimen, or meets LCBI criterion 2 (without fever) and matching common commensal(s) in the urine. All elements of the ABUTI criterion must occur during the Infection Window Period

(See Definition Chapter 2 Identifying HAIs in NHSN).

\*\* Organisms identified by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST).

7. Definition of Location of Attribution: The inpatient location where the patient was assigned on the date of the UTI event.

8. Definition of Date of Event: The date when the first element used to meet the UTI criterion occurred during the infection window period.

9. Definition of Repeat Infection Timeframe (RIT): The RIT is a 14-day timeframe during which no new infections of the same type are reported. The date of event is Day 1 of the 14-day RIT. Additional pathogens recovered during the RIT from the same type of infection are added to the event. The RIT will apply at the level of specific type of infection with the exception of BSI, UTI, and PNEU where the RIT will apply at the major type of infection.

## DENOMINATOR STATEMENT

Total number of predicted healthcare-associated CAUTI among inpatient care locations under surveillance for CAUTI during the data period, based on the national CAUTI baseline Data is calculated using the facility's number of catheter days and the following significant risk factors:

- Acute Care Hospitals: CDC Location, Facility bed size, Medical school affiliation, and Facility type
- Critical Access Hospitals: Medical school affiliation
- Long-Term Acute Hospitals: Average length of stay, Setting type, and Location type
- Inpatient Rehabilitation Facilities: Setting type, Proportion of admissions with traumatic and non-traumatic spinal cord dysfunction, Proportion of admissions with stroke

#### DENOMINATOR DETAILS

Numbers of indwelling urinary catheter days attributed to each location are counted for each data period using the following definitions and guidelines. All indwelling urinary catheter days for each location and data period are summed.

1. Definition of indwelling catheter day: For each patient, a day that an indwelling urinary catheter was present at the time of the indwelling urinary catheter day count.

2. CDC Location (acute care hospitals, long term acute care hospitals): Each patient care area in a facility that is monitored in NHSN is "mapped" to one or more CDC Locations. The specific CDC Location code is determined by the type of patients cared for in that area according to the 80% Rule. That is, if 80% of patients are of a certain type (e.g., pediatric patients with orthopedic problems) then that area is designated as that type of location (in this case, an Inpatient Pediatric Orthopedic Ward).

https://www.cdc.gov/nhsn/pdfs/pscmanual/15locationsdescriptions\_current.pdf

3. Medical school affiliation categories:

a. Major – facility has a program for medical students and post-graduate medical training

b. Graduate – facility has a program for post-graduate medical training (i.e., residency and/or fellowships)

c. Undergraduate: facility has a program for medical students only

4. Facility bedsize: Number of beds set up and staffed in the healthcare facility

5. Setting (Freestanding or Within a Hospital): Describes physical placement of LTACH or IRF and does not define financial or administrative relationship with other healthcare facility types.

6. Definition for Facility Physician Education Status: Teaching statuses: major, graduate, undergraduate - Major: Facility has a program for medical students and post-graduate medical training; Graduate: Facility has a program for post-graduate medical training (i.e., residency and/or fellowships); Undergraduate: Facility has a program for medical students only.

7. Proportion of admissions within a diagnostic category: number of admissions during the calendar year where the primary diagnosis of that type (e.g. traumatic spinal cord dysfunction) divided by the total number of admissions during the calendar year

#### EXCLUSIONS

The following are not considered indwelling catheters by NHSN definitions:

1. Suprapubic catheters

2.Condom catheters

3."In and out" catheterizations

4. Nephrostomy tubes

Note, that if a patient has either a nephrostomy tube or a suprapubic catheter and also has an indwelling urinary catheter, the indwelling urinary catheter will be included in the CAUTI surveillance.

# **EXCLUSION DETAILS**

See S. 10

#### **RISK ADJUSTMENT**

Statistical risk model

## STRATIFICATION

CAUTI data is stratified by facility-specific and individual patient location data (i.e., bedsize of location, affiliation and level of affiliation with a medical school [Teaching statuses: major, graduate, undergraduate, not affiliated - See definitions S.7. above.

## TYPE SCORE

Ratio better quality = lower score

#### ALGORITHM

The Standardized Infection Ratio (SIR) for annual and quarterly data aggregation and analysis of CAUTI events is calculated for each healthcare facility for a specified time period. The SIR is an indirect standardization method for summarizing healthcare associated infection (HAI) experience, including CAUTI events, in a single group of data or across any number of stratified groups of data. To produce the SIR:

1. Identify number of observed healthcare-associated CAUTIs for a given time period by adding the total number of observed CAUTIs across the facility.

2. Calculate the number of predicted healthcare-associated CAUTIs for each CDC location using a negative binomial regression model and the risk factors described above.

3. Calculate the number of predicted healthcare-associated CAUTIs for the facility and time period by adding the predicted number of CAUTIs for each location across the facility.

4. Divide the number of observed healthcare-associated CAUTIs (1 above) by the number of predicted healthcare-associated CAUTIs (3 above) to obtain the SIR.

5. Perform a Poisson test to compare the SIR obtained in 4 above to the nominal value of 1. P-value and confidence interval will be calculated, which can be used to assess significance of SIR.

(The NHSN analysis tool will perform the calculations once the patient infection data, denominator information, and related facility-level information are entered into the system.)

The Adjusted Ranking Metric (ARM) for annual data aggregation and analysis of HAI events, including CAUTI events, combines the method of indirect standardization used to calculate the unadjusted SIR described above with a Bayesian random effects hierarchical model to account

for the potentially low precision and/or reliability inherent in the unadjusted SIR. A Bayesian posterior distribution constructed through Monte Carlo Markov Chain sampling is used to produce the adjusted numerator. The ARM enables more meaningful statistical differentiation between hospitals by accounting for differences in patient case-mix, exposure volume (e.g. patient days, indwelling urinary catheter days, central line-days, surgical procedure volume), and unmeasured factors that are not reflected in the unadjusted SIR and that cause variation between healthcare facilities. Accounting for these sources of variability enables better measure discrimination between facilities and leads to more reliable performance rankings. To produce the ARM:

1. Identify the number of CAUTI in each location

2. Obtain the adjusted number of observed CAUTIs by using a Bayesian posterior distribution constructed through Monte Carlo Markov Chain sampling which results from a Bayesian random effects model.

3. Total these numbers for an observed number of CAUTIs

4. Obtain the predicted number of CAUTIs in the same locations by multiplying the observed indwelling urinary catheter days according to the factors significantly associated with predicting CAUTI incidence as identified through a Log-linear Negative Binomial Regression Model.

5. Divide the total number of adjusted CAUTI events ("3" above) by the predicted number of CAUTIs ("4" above).

6. Result = ARM

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0139 National Healthcare Safety Network (NHSN) Central line-associated Bloodstream Infection (CLABSI) Outcome Measure

# STEWARD

Centers for Disease Control and Prevention

# DESCRIPTION

Standardized Infection Ratio (SIR) and Adjusted Ranking Metric (ARM) of healthcare-associated, central line-associated bloodstream infections (CLABSI) will be calculated among patients in bedded inpatient care locations.

This includes acute care general hospitals, long-term acute care hospitals, rehabilitation hospitals, oncology hospitals, and behavioral health hospitals.

## TYPE

Outcome

#### DATA SOURCE

Electronic Health Data, Electronic Health Records, Other, Paper Medical Records NHSN Primary BSI collection form

NHSN Denominator for ICU form

NHSN Denominator for NICU form

NHSN Denominator for Specialty Care Area/Oncology Form

## LEVEL

Facility, Population : Regional and State

## SETTING

Inpatient/Hospital, Other, Post-Acute Care Oncology Hospital; IRF; LTACH; Inpatient Psych

#### NUMERATOR STATEMENT

Total number of observed healthcare-associated CLABSI among patients in bedded inpatient care locations.

## NUMERATOR DETAILS

Numbers of CLABSIs attributed to each location are counted for each month using the definitions below. CLABSIs attributed to neonatal ICUs are stratified by birth weight category. CLABSIs attributed to Specialty Care Areas or Oncology Locations are stratified by association with temporary vs. permanent central line.

1. Definition of infection that is Present on Admission (POA): An infection is considered Present on Admission (POA) if the date of event of the NHSN site-specific infection criterion occurs during the POA time period, which is defined as the day of admission to an inpatient location (calendar day 1), the 2 days before admission, and the calendar day after admission. For purposes of NHSN surveillance and determination of the Repeat Infection Timeframe (as defined below) if the date of event is determined to be either of the two days prior to inpatient admission, then the date of event will be hospital day 1. POA events are excluded

2. Definition of Healthcare-associated Infection (HAI): An infection is considered a Healthcareassociated Infection (HAI) if the date of event of the NHSN site-specific infection criterion occurs on or after the 3rd calendar day of admission to an inpatient location where day of admission is calendar day 1.

3. Definition of Eligible Central Line: A CL that has been in place for more than two consecutive calendar days (on or after CL day 3), following the first access of the central line, in an inpatient location, during the current admission. Such lines are eligible for CLABSI events and remain eligible for CLABSI events until the day after removal from the body or patient discharge, whichever comes first.

4. Definition of Central line: An intravascular catheter that terminates at or close to the heart or in one of the great vessels that is used for infusion, withdrawal of blood, or hemodynamic monitoring. The following are considered great vessels for the purpose of reporting CLABSI events and counting central-line device days in the NHSN system: Aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, external iliac veins, common iliac veins, femoral veins, and in neonates, the umbilical artery/vein.

Neither the type of device nor the insertion site are used to determine if a device is considered a central line for NHSN reporting purposes.

The following devices are not considered central lines for NHSN Reporting Purposes:

- Non-lumened Pacemaker wires and other non-lumened devices inserted into central blood vessels or the heart
- Arterial catheters

- Arteriovenous fistula
- Arteriovenous graft
- Atrial catheters (also known as transthoracic intra-cardiac catheters, those catheters inserted directly into the right or left atrium via the heart wall)
- Extracorporeal membrane oxygenation (ECMO)
- Hemodialysis reliable outflow (HERO) dialysis catheters
- Intra-aortic balloon pump (IABP) devices
- Peripheral IV or Midlines
- Ventricular Assist Device (VAD)

5. Definition of CLABSI: A laboratory confirmed bloodstream infection which meets LCBI Criterion 1, 2, or 3, and where an eligible BSI organism is identified and an eligible central line is present on the LCBI DOE or the day before. Access definition: The performance of any of the following activities during the current inpatient admission

6. Definition of Infusion: The administration of any solution through the lumen of a catheter into a blood vessel. Infusions include continuous infusion (for example, nutritional fluids or medications), intermittent infusion (for example, IV flush), IV antimicrobial administration, and blood transfusion or hemodialysis treatment.

7. Definition of Temporary Central Line: A non-tunneled, non-implanted catheter.

8. Definition of Permanent Central Line: Tunneled catheters, (including tunneled dialysis catheters) and implanted catheters (including ports)

9. Definition of Laboratory Confirmed Bloodstream Infection (LCBI):

For all LCBI definitions, the following resources may be referenced:

- Appendix B: Secondary BSI Guide of the CLABSI Surveillance protocol can be found at http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC\_CLABScurrent.pdf (p.32)
- NHSN Common Commensals from the NHSN Organism List can be found at https://www.cdc.gov/nhsn/xls/master-organism-com-commensals-lists.xlsx

LCBI must meet one of the following criteria:

LCBI Criterion 1: Patient of any age has a recognized bacterial or fungal pathogen not included on the NHSN common commensal list, identified from one or more blood specimens obtained by a culture or non-culture based microbiologic testing methods

# AND

Organism(s) identified in blood is not related to an infection at another site

(See Appendix B [p.32] Secondary BSI Guide)

LCBI Criterion 2: Patient of any age has at least one of the following signs or symptoms: fever (>38 degrees C), chills, or hypotension and positive Organism(s) identified in blood AND

Organism(s) identified in blood is not related to an infection at another site AND

The same NHSN common commensal is identified by a culture or non-culture based microbiologic testing method, from two or more blood specimens collected on separate occasions not related to an infection at another site and the same NHSN common commensal is

identified from two or more blood specimens drawn on separate occasions, by a culture or nonculture based microbiologic testing method.

Common Commensal organisms include, but not are not limited to, diphtheroids (Corynebacterium spp. not C. diphtheria), Bacillus spp. (not B. anthracis), Propionibacterium spp., coagulase-negative staphylococci (including S. epidermidis), viridans group streptococci, Aerococcus spp. Micrococcus spp, and Rhodococcus spp.

For a full list of Common Commensals see the Common Commensal tab of the NHSN organisms list. Criterion elements must occur within the Infection Window Period, the seven-day time period which includes the date the positive blood culture was collected, the 3 calendar days before and the 3 calendar days after. Note: The matching common commensals represent a single element; therefore, the collection date of the first common commensal is the date of the element used to determine the Date of Event.

LCBI Criterion 3: Patient 1 year of age or less has at least one of the following signs or symptoms: fever (>38 degrees C), hypothermia (<36 degrees C), apnea, or bradycardia and organism identified in blood not related to an infection at another site (See Appendix B Secondary BSI Guide) and the same NHSN common commensal is identified from two or more blood specimens drawn on separate occasions, by a culture or non-culture based microbiologic testing.

10. Criteria for meeting Mucosal Barrier Injury (MBI) Laboratory Confirmed Bloodstream Infection (LCBI)

For all MBI-LCBI definitions, the following resources may be referenced:

- Appendix B: Secondary BSI Guide of the CLABSI Surveillance protocol can be found at http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC\_CLABScurrent.pdf (p.32)
- NHSN Common Commensals from the NHSN Organism List can be found at https://www.cdc.gov/nhsn/xls/master-organism-com-commensals-lists.xlsx
- NHSN MBI Organism List can be found at https://www.cdc.gov/nhsn/xls/analysis/nhsndata-dictionary.xlsx

MBI-LCBI Criterion1: Patient of any age fully meets criterion 1 for LCBI with at least one blood specimen identified by a culture or non-culture based microbiologic testing method, with ONLY intestinal organisms from the NHSN MBI organism list and patient meets at least one of the following:

a)Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood culture:

i.) Grade III or IV gastrointestinal graft versus host disease [GI GVHD]

ii.)1 liter or more diarrhea in a 24-hour period (or 20 or more mL/kg in a 24-hour period for patients <18 years of age) with onset on or within 7 calendar days before the date the positive blood specimen was collected

b)Is neutropenic, defined as at least 2 separate days with values of absolute neutrophil count (ANC) and/or white blood cell (WBC) values <500 cells/mm3 within a seven-day time period which includes the collection date of the positive blood specimen (Day 1), the 3 calendar days before and the 3 calendar days after.

MBI-LCBI Criterion 2: Patient of any age meets criterion 2 for LCBI when the blood specimens identify only viridans group streptococci or Rothia spp and patient meets at least one of the following:

a)Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood culture:

i.) Grade III or IV gastrointestinal graft versus host disease [GI GVHD]

ii.)1 liter or more diarrhea in a 24-hour period (or 20 or more mL/kg in a 24-hour period for patients <18 years of age) with onset on or within 7 calendar days before the date the positive blood specimen was collected

b)Is neutropenic, defined as at least 2 separate days with values of absolute neutrophil count (ANC) and/or white blood cell (WBC) values <500 cells/mm3 within a seven-day time period which includes the collection date of the positive blood specimen (Day 1), the 3 calendar days before and the 3 calendar days after

MBI-LCBI Criterion 3: Patient 1 year of age or less meets criterion 3 for LCBI when the blood specimens identify only viridans group streptococci or Rothia spp and patient meets at least one of the following:

a)Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood culture:

i.) Grade III or IV gastrointestinal graft versus host disease [GI GVHD]

ii.)1 liter or more diarrhea in a 24-hour period (or 20 or more mL/kg in a 24-hour period for patients <18 years of age) with onset on or within 7 calendar days before the date the positive blood specimen was collected

b)Is neutropenic, defined as at least 2 separate days with values of absolute neutrophil count (ANC) and/or white blood cell (WBC) values <500 cells/mm3 within a seven-day time period which includes the collection date of the positive blood specimen (Day 1), the 3 calendar days before and the 3 calendar days after

11. Definition of CDC Location: The patient care area to which a patient is assigned while receiving care in the healthcare facility. NOTE: Only locations where patients are housed overnight (i.e., inpatient locations) and where denominator data are collected can be used for reporting CLABSI data. Operating rooms (including cardiac cath labs, c-section rooms, and interventional radiology) and outpatient locations are not valid locations for this type of surveillance. See attached list of CDC/NHSN Location Types to identify Special Care Areas or Oncology Locations. https://www.cdc.gov/nhsn/xls/analysis/nhsn-data-dictionary.xlsx

12. Definition of Infection Window Period: Infection Window Period is defined as the 7-days during which all site-specific infection criteria must be met. It includes the day the first positive diagnostic test that is an element of the site-specific infection criterion, was obtained, the 3 calendar days before and the 3 calendar days after. For purposes of defining the Infection Window Period the following are considered diagnostic tests:

- laboratory specimen collection
- imaging test
- procedure or exam

13. Definition of Repeat Infection Timeframe (RIT): The RIT is a 14-day timeframe during which no new infections of the same type are reported. The date of event is Day 1 of the 14-day RIT. Additional pathogens recovered during the RIT from the same type of infection are added to the event.

The RIT will apply at the level of specific type of infection with the exception of BSI, UTI, and PNEU where the RIT will apply at the major type of infection.

14. Definition of Date of Event (DOE): The Date of Event is the date the first element used to meet an NHSN site-specific infection criterion occurs for the first time within the seven-day infection window period.

15. Definition of Location of Attribution: The location to which the CLABSI is attributed.

16. Definition of birthweight: Birthweight is the weight of the infant at the time of birth and should not be changed as the infant gains weight. The birthweight categories are as follows:

A = 750 g or less; B = 751-1000 g; C = 1001-1500 g; D = 1501-2500 g; E = >2500 g.

17. Definitions for facility physician education status: Teaching statuses: major, graduate, undergraduate - Major: Facility has a program for medical students and post-graduate medical training; Graduate: Facility has a program for post-graduate medical training (i.e., residency and/or fellowships); Undergraduate: Facility has a program for medical students only.

Exclusions from CLABSI:

1. Bloodstream Infections (BSI) accompanied by documentation of observed or suspected injection into an IV line by the patient during the BSI Infection Window Period are excluded as CLABSIs regardless of presence of central line.

2. Group B Streptococcus identified from blood, with a date of event during the first 6 days of life, are excluded as CLABSIs regardless of presence of central line.

3. Occasionally, a patient with both a central line and another vascular access device\* will have pus at the other access site. If there is pus at the site of one of the following vascular access devices and a specimen collected from that site has at least one matching organism to an organism identified in blood this will be considered an LCBI but not a CLABSI for NHSN reporting purposes.

\*Vascular access devices included in this exception are limited to:

- Arterial catheters
- Arteriovenous fistulae
- Arteriovenous grafts
- Atrial catheters (also known as transthoracic intra-cardiac catheters, those catheters inserted directly into the right or left atrium via the heart wall)
- Hemodialysis reliable outflow (HERO) dialysis catheters
- Intra-aortic balloon pump (IABP) devices
- Non-accessed CL (those neither inserted nor used during current admission)
- Peripheral IV or Midlines

4. CLABSIs in which any of the following organisms are the only pathogens identified are excluded:

- Blastomyces spp.
- Histoplasma spp.
- Coccidioides spp.
- Paracoccidioides spp.
- Cryptococcus spp.
- Pneumocystis spp.
- Any virus
- Parasites

5. If the date of blood specimen collection is on or after the date of documentation of evidence of consent AND the patient is being supported for organ donation purposes, an event identified using the blood specimen result should not be reported as CLABSI.

6. MBI CLABSI events will be excluded from the CLABSI measure

7. Munchausen Syndrome by Proxy (MSBP): If during the current admission, there is documentation of known or suspected (MSBP), also known as factitious disorder imposed on another and a CL has been in place for more than 2 days on a BSI DOE, these events are considered LCBIs but are NOT considered central line associated.

8. Epidermolysis bullosa (EB): If during the current admission, there is a diagnosis of and a CL has been in place for more than 2 days on a BSI DOE, these events are considered LCBIs but are NOT considered central line associated.

9. Extracorporeal life support (ECMO): A BSI meeting LCBI criteria with an eligible central line where ECMO is present for more than 2 days on the BSI DOE, and is still in place on the DOE or the day before, will be considered an LCBI but not a CLABSI for NHSN reporting purposes.

10. Ventricular assist device (VAD): A BSI meeting LCBI criteria with an eligible central line where ECMO is present for more than 2 days on the BSI DOE, and is still in place on the DOE or the day before, will be considered an LCBI but not a CLABSI for NHSN reporting purposes.

# DENOMINATOR STATEMENT

Total number of predicted healthcare-associated CLABSI among patients in bedded inpatient care locations, calculated using the facility's number of central line days and the following significant risk factors:

- Acute Care Hospitals: CDC location, facility bed size, medical school affiliation, facility type, birthweight category (NICU locations only)
- Critical Access Hospitals: no significant risk factors, calculation based intercept only model
- Inpatient Rehabilitation Facilities: Proportion of admissions with stroke, proportion of admissions in other non-specific diagnostic categories
- Long Term Acute Care Hospitals: CDC location type , facility bed size, average length of stay, proportion of admissions on a ventilator, proportion of admissions on hemodialysis

## DENOMINATOR DETAILS

Methodologies for counting central line days differ according to the location of the patients being monitored. Numbers of central line days attributed to each location are counted for each data period utilizing the following definitions and guidelines. In locations that are not neonatal ICUs, SCA or oncology locations, all CL days for that location and data period are summed. For neonatal ICU central line days counts are stratified by birthweight category. CL day counts for Special Care Areas or Oncology Locations are stratified by temporary vs. permanent central line type.

For locations other than specialty care areas/oncology (SCA/ONC) and NICUs (e.g., ICUs, stepdown units, wards), the denominator sampling method can be used. (Refer to sampling method in the Device-Associated BSI protocol available at

www.cdc.gov/nhsn/PDFs/pscManual/4PSC\_CLABScurrent.pdf)

1. Definition of central line day: For each patient, a day that at least one central line was present at the time of the CL day count.

2. Definition of CDC Location (acute care hospitals, long term acute care hospitals): Each patient care area in a facility that is monitored in NHSN is "mapped" to one or more CDC Locations. The specific CDC Location code is determined by the type of patients cared for in that area according to the 80% Rule. That is, if 80% of patients are of a certain type (e.g., pediatric patients with orthopedic problems) then that area is designated as that type of location (in this case, an Inpatient Pediatric Orthopedic Ward).

https://www.cdc.gov/nhsn/pdfs/pscmanual/15locationsdescriptions\_current.pdf

3. Definition of Medical school affiliation categories:

a. Major – facility has a program for medical students and post-graduate medical training

b. Graduate – facility has a program for post-graduate medical training (i.e., residency and/or fellowships)

c. Undergraduate: facility has a program for medical students only

4. Definition of Facility bed size: Number of beds set up and staffed in the healthcare facility

5. Setting (Freestanding or Within a Hospital): Describes physical placement of LTACH or IRF and does not define financial or administrative relationship with other healthcare facility types.

6. Average Length of Stay: number of patient days during the calendar year divided by the number of admissions during the calendar year

7. Proportion of admissions within a diagnostic category: number of admissions during the calendar year where the primary diagnosis is of that type (e.g., traumatic spinal cord dysfunction) divided by the total number of admissions during the calendar year

#### EXCLUSIONS

Data from patients who are not assigned to an inpatient bed are excluded from the denominator counts, including outpatient clinics, 24-hour observation units, and emergency department visits. Inpatient rehab locations and inpatient psychiatric locations that have their own Centers for Medicare and Medicaid Services (CMS) Certification Number (CCN) are excluded.

#### **EXCLUSION DETAILS**

See S.8. Definition of inpatient - A patient who is located in an inpatient location for care and treatment at the time of the daily inpatient census count.

#### **RISK ADJUSTMENT**

Statistical risk model

## **STRATIFICATION**

The final risk model for the CLABSI SIR in Acute Care Hospitals includes: CDC locations, facility bed size, medical school affiliation, and facility type. For NICU locations the risk factor included in the final model was birthweight category. See S7 above

# TYPE SCORE

Ratio better quality = lower score

#### ALGORITHM

The Standardized Infection Ratio (SIR) for annual and quarterly data aggregation and analysis of CLABSI events is calculated for each healthcare facility for a specified time period. The SIR is an

indirect standardization method for summarizing healthcare associated infection (HAI) experience, including CLABSI events, in a single group of data or across any number of stratified groups of data. To produce the SIR:

1. Identify number of observed healthcare-associated CLABSIs for a given time period by adding the total number of observed CLABSIs across the facility.

2. Calculate the number of predicted healthcare-associated CLABSIs for each CDC location using a negative binomial regression model and the risk factors described above.

3. Calculate the number of predicted healthcare-associated CLABSIs for the facility and time period by adding the predicted number of CLABSIs for each location across the facility.

4. Divide the number of observed healthcare-associated CLABSIs (1 above) by the number of predicted healthcare-associated CLABSIs (3 above) to obtain the SIR.

5. Perform a Poisson test to compare the SIR obtained in 4 above to the nominal value of 1. P-value and confidence interval will be calculated, which can be used to assess significance of SIR.

(The NHSN analysis tool will perform the calculations once the patient infection data and denominator information are entered into the system.)

The Adjusted Ranking Metric (ARM) for annual data aggregation and analysis of HAI events, including CLABSI events, combines the method of indirect standardization used to calculate the unadjusted SIR described above with a Bayesian random effects hierarchical model to account for the potentially low precision and/or reliability inherent in the unadjusted SIR. A Bayesian posterior distribution constructed through Monte Carlo Markov Chain sampling is used to produce the adjusted numerator. The ARM enables more meaningful statistical differentiation between hospitals by accounting for differences in patient case-mix, exposure volume (e.g. patient days, central line-days, surgical procedure volume), and unmeasured factors that are not reflected in the unadjusted SIR and that cause variation between healthcare facilities. Accounting for these sources of variability enables better measure discrimination between facilities and leads to more reliable performance rankings. To produce the ARM:

1. Identify the number of CLABSI in each location

2. Obtain the adjusted number of observed CLABSIs by using a Bayesian posterior distribution constructed through Monte Carlo Markov Chain sampling which results from a Bayesian random effects model.

3. Total these numbers for an observed number of CLABSIs

4. Obtain the predicted number of CLABSIs in the same locations by multiplying the observed central line days according to the factors significantly associated with predicting CLABSI incidence as identified through a Log-linear Negative Binomial Regression Model.

5. Divide the total number of adjusted CLABSI events ("3" above) by the predicted number of CLABSIs ("5" above).

6. Result = ARM

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# 0204 Skill mix (Registered Nurse [RN], Licensed Vocational/Practical Nurse [LVN/LPN], unlicensed assistive personnel [UAP], and contract)

# STEWARD

American Nurses Association

# DESCRIPTION

NSC-12.1 - Percentage of total productive nursing hours worked by RN (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.2 - Percentage of total productive nursing hours worked by LPN/LVN (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.3 - Percentage of total productive nursing hours worked by UAP (employee and contract) with direct patient care responsibilities by hospital unit.

NSC-12.4 - Percentage of total productive nursing hours worked by contract or agency staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities by hospital unit.

Note that the skill mix of the nursing staff (NSC-12.1, NSC-12.2, and NSC-12.3) represent the proportions of total productive nursing hours by each type of nursing staff (RN, LPN/LVN, and UAP); NSC-12.4 is a separate rate.

Measure focus is structure of care quality in acute care hospital units.

# түре

Structure

# DATA SOURCE

Management Data, Other Database: National Database of Nursing Quality Indicators(R) [NDNQI(R)]; Hospitals have NDNQI guidelines and Excel spreadsheets to guide data collection; data are provided to NDNQI via web based data entry or XML upload.

# LEVEL

Facility, Other

# SETTING

Inpatient/Hospital

# NUMERATOR STATEMENT

Four separate numerators are as follows:

RN hours – Productive nursing care hours worked by RNs with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

LPN/LVN hours – Productive nursing care hours worked by LPNs/LVNs with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

UAP hours – Productive nursing care hours worked by UAP with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

Contract or agency hours – Productive nursing care hours worked by nursing staff (contract or agency staff) with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

# NUMERATOR DETAILS

Nursing care hours are defined as the number of productive hours worked by nursing staff (registered nurse [RN], licensed vocational/practical nurse [LVN/LPN], and unlicensed assistive personnel [UAP]) assigned to the unit who have direct patient care responsibilities for greater than 50% of their shift.

Productive hours are actual direct patient care hours worked by nursing staff including overtime, not budgeted or scheduled hours. Vacation, sick time, orientation, education leave, or committee time are considered non-productive hours. However, orientation programs vary from hospital to hospital. Once orientees reach the point where they are considered part of the staffing matrix, their work hours are charged to the unit and they would be replaced if they call in sick, then their hours are counted as productive.

Direct patient care responsibilities: Patient centered nursing activities by unit-based staff in the presence of the patient and activities that occur away from the patient that are patient related:

- Medication administration
- Nursing treatments
- Nursing rounds
- Admission, transfer, discharge activities
- Patient teaching
- Patient communication
- Coordination of patient care
- Documentation time
- Treatment planning
- Patient screening (e.g. risk) and assessment

Nursing staff included are either staff employed by the facility or temporary staff who are not employed by the facility (contracted/agency staff). Float staff—those are assigned to a unit other than their unit of employment on an as-needed basis—must be counted and reported in the unit's total nursing care hours where they provided direct patient care.

Included nursing staff:

Staff who are counted in the unit's staffing matrix, and

Are replaced if they call in sick, and

Work hours are charged to the unit's cost center

Excluded nursing staff:

1)Persons whose primary responsibility is administrative in nature

2)Specialty teams, patient educators, or case managers who are not assigned to a specific unit

3)Unit secretaries or clerks, monitor technicians, and other with no direct patient care responsibilities (Therapy assistants, student nurses who are fulfilling educational requirements, sitters who either are not employed by the facility or who are employed by the facility, but are not providing typical UAP activities)

Unlicensed Assistive Personnel (UAPs): Individuals trained to function in an assistive role to nurses in the provision of patient care, as delegated by and under the supervision of the registered nurse. Typical activities performed by UAPs may include (but are not limited to): taking vital signs, bathing, feeding, or dressing patients, assisting patients with transfers, ambulation or toileting.

Included UAPs: nursing assistants, orderlies, patient care technicians/assistants, graduate nurses (not yet licensed) who have completed unit orientation.

Mental Health Technicians (MHT): For Psychiatric In-Patient Units ONLY

Individuals functioning in an assistive role, for which your facility requires course work or training that is different from UAP. They may be licensed or unlicensed. MHT hours are included in UAP hours when reporting, but their hours are collected separately from UAP hours if persons in this job position also meet the following criteria:

- They are engaged in direct care activities greater than 50% time, and
- Their position is staffed 24/7 and replaced when they call in sick, and
- Their hours are included in the nursing staff budget

Data Elements:

RN hours (Employee)

RN hours (Contract/Agency)

LPN/LVN hours (Employee)

LPN/LVN hours (Contract/Agency)

UAP hours (Employee)

UAP hours (Contract/Agency)

MHT hours (Employee)

MHT hours (Contract/Agency)

Year

Month

Type of Unit

## DENOMINATOR STATEMENT

Denominator is the total number of productive hours worked by employee or contract nursing staff with direct patient care responsibilities (RN, LPN/LVN, and UAP) for each hospital in-patient unit during the calendar month.

## DENOMINATOR DETAILS

Same as numerator; Total number of productive hours worked by nursing staff with direct patient care responsibilities for each in-patient unit is obtained by summing all number of productive hours worked by specific nursing staff with direct patient care responsibilities (RN, LPN/LVN, or UAP) for each hospital in-patient unit during the calendar month.

Nursing staff included are either staff employed by the facility or temporary staff who are not employed by the facility (contracted/agency staff). Float staff—those are assigned to a unit other than their unit of employment on an as-needed basis—must be counted and reported in the unit's total nursing care hours where they provided direct patient care.

Included nursing staff:

Staff who are counted in the unit's staffing matrix, and Are replaced if they call in sick, and Work hours are charged to the unit's cost center. Excluded nursing staff: 1)Persons whose primary responsibility is administrative in nature 2)Specialty teams, patient educators, or case managers who are not assigned to a specific unit 3)Unit secretaries or clerks, monitor technicians, and other with no direct patient care responsibilities Data Elements: RN hours (Employee) RN hours (Contract/Agency) LPN/LVN hours (Employee) LPN/LVN hours (Contract/Agency) UAP hours (Employee) UAP hours (Contract/Agency) MHT hours (Employee) MHT hours (Contract/Agency) Month Year

Type of Unit

## **EXCLUSIONS**

Same as numerator; nursing staff with no direct patient care responsibilities are excluded.

#### **EXCLUSION DETAILS**

Excluded nursing staff:

Persons whose primary responsibility is administrative in nature.

Specialty teams, patient educators, or case managers who are not assigned to a specific unit. Unit secretaries or clerks, monitor technicians, and other with no direct patient care responsibilities.

# **RISK ADJUSTMENT**

Other Each unit is stratified by unit type (e.g., critical care, step down, medical), which is not identical to risk, but may be related.

# STRATIFICATION

Stratification variables are patient population and unit type. Units are stratified by patient population first and then unit type based on acuity level, age, or type of service provided.

- 1. Patient population
- 1) Adult population: limited to units generally caring for patients over 16 years old.
- 2) Pediatric population: limited to units generally caring for patients under 18 years old.
- 3) Neonate population: limited to units caring for newborn infants.

4) Psychiatric population: units caring for patients with psychiatric disorders.

5) Rehabilitation population: limited to distinct acute rehabilitation units providing intensive therapy 5 days/week.

2. Unit types by population

1) Adult population

**Critical Care** 

Highest level of care, includes all types of intensive care units. Optional specialty designations include: Burn, Cardiothoracic, Coronary Care, Medical, Neurology, Pulmonary, Surgical and Trauma.

Step-Down

Limited to units that provide care for patients requiring a lower level of care than critical care units and higher level of care than provided on medical/surgical units. Examples include progressive care or intermediate care units. Telemetry alone is not an indicator of acuity level.

Medical

Units that care for patients admitted to medical services, such as internal medicine, family practice, or cardiology. Optional specialty designations include: BMT (Bone Marrow Transplant), Cardiac, GI, Infectious Disease, Neurology, Oncology, Renal or Respiratory.

Surgical

Units that care for patients admitted to surgical services, such as general surgery, neurosurgery, or orthopedics. Optional specialty designations include: Bariatric, Cardiothoracic, Gynecology, Neurosurgery, Orthopedic, Plastic Surgery, Transplant or Trauma.

Medical-Surgical Combined

Units that care for patients admitted to either medical or surgical services. Optional specialty designations include: Cardiac, Neuro/Neurosurgery or Oncology.

**Critical Access** 

A unit located in a Critical Access Hospital that cares for a combination of patients that may include critical care, medical-surgical, skilled nursing (swing bed) and/or obstetrics.

2) Pediatric population

Refer to Adult unit type descriptions for corresponding unit types.

Critical care

Step-Down

Medical

Surgical

Medical-Surgical Combined

3) Neonate population

The three unit types below (Level I, II, and III/IV) are based on the Guidelines for Perinatal Care, 5th Ed., which are used by state certification programs. Level I, II, and III/IV neonatal units are the highest level of infant care provided, and are specified by sequential level of acuity.

Well-baby Nursery

Level I Continuing Care

Level II Intermediate Care

Level III/IV Critical Care

4) Psychiatric population

Adult

Units caring for adult patients with acute psychiatric disorders.

Child/Adolescent

Units caring for children and/or adolescents, predominantly ages 2-18 years old, with acute psychiatric disorders.

Geripsych

Units caring for elderly patients with acute psychiatric disorders.

Other (Behavioral Health, Specialty, Multiple Psychiatric Unit Types)

**Behavioral Health** 

Units caring for individuals of any age with eating disorders or substance abuse (alcohol and drugs) diagnoses.

Specialty

Units caring for patients of any age with dual diagnoses (e.g., mental illness and mental retardation, or substance abuse and an additional mental illness diagnosis).

Multiple Psychiatric Unit Types

Units caring for patients that encompass 3 or more of the above unit types, but for which no one unit type comprises greater than 50% of the entire unit.

5) Rehabilitation population

Adult

Limited to units generally caring for rehab patients over 16 years old. Optional specialty designations include: Brain Injury/SCI, Cardiopulmonary, Neuro/Stroke and Orthopedic/Amputee Rehab units.

Pediatric

Limited to units generally caring for rehab patients under 18 years old.

## TYPE SCORE

Rate/proportion better quality = higher score

## ALGORITHM

Eligible unit identified and selected; input nursing care hours for each eligible staff category by month; then perform calculations to produce the quarterly nursing care hours for each eligible staff category by summing monthly values of the 3 months; then calculate the total nursing care hours by summing quarterly nursing care hours for each eligible staff category; then divide the quarterly nursing care hours for each eligible staff category by the total quarterly nursing care hours.

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## **0205 Nursing Hours per Patient Day**

#### **STEWARD**

American Nurses Association

#### DESCRIPTION

NSC-13.1 (RN hours per patient day) – The number of productive hours worked by RNs with direct patient care responsibilities per patient day for each in-patient unit in a calendar month.

NSC-13.2 (Total nursing care hours per patient day) – The number of productive hours worked by nursing staff (RN, LPN/LVN, and UAP) with direct patient care responsibilities per patient day for each in-patient unit in a calendar month.

Measure focus is structure of care quality in acute care hospital units.

## TYPE

Structure

#### DATA SOURCE

Management Data, Other Database: National Database of Nursing Quality Indicators(R) [NDNQI(R)]; Hospitals have NDNQI guidelines and Excel spreadsheets to guide data collection; data are provided to NDNQI via web based data entry or XML upload.

# LEVEL

Facility, Other

#### SETTING

Inpatient/Hospital

#### NUMERATOR STATEMENT

Total number of productive hours worked by nursing staff with direct patient care responsibilities for each hospital in-patient unit during the calendar month.

## NUMERATOR DETAILS

Nursing care hours are defined as the number of productive hours worked by nursing staff (registered nurse [RN], licensed vocational/practical nurse [LVN/LPN], and unlicensed assistive personnel [UAP]) assigned to the unit who have direct patient care responsibilities for greater than 50% of their shift.

Productive hours are actual direct patient care hours worked by nursing staff including overtime, not budgeted or scheduled hours. Vacation, sick time, orientation, education leave, or committee time are considered non-productive hours. However, orientation programs vary from hospital to hospital. Once orientees reach the point where they are considered part of the staffing matrix, their work hours are charged to the unit, and they would be replaced if they call in sick, then their hours are counted as productive.

Direct patient care responsibilities: Patient centered nursing activities by unit-based staff in the presence of the patient and activities that occur away from the patient that are patient related:

- Medication administration
- Nursing treatments

- Nursing rounds
- Admission, transfer, discharge activities
- Patient teaching
- Patient communication
- Coordination of patient care
- Documentation time
- Treatment planning
- Patient screening (e.g. risk) and assessment

Nursing staff included are either staff employed by the facility or temporary staff who are not employed by the facility (contracted/agency staff). Float staff—those are assigned to a unit other than their unit of employment on an as-needed basis—must be counted and reported in the unit's total nursing care hours where they provided direct patient care.

Included nursing staff:

Staff who are counted in the unit's staffing matrix, and

Are replaced if they call in sick, and

Work hours are charged to the unit's cost center.

Excluded nursing staff:

Persons whose primary responsibility is administrative in nature.

Specialty teams, patient educators, or case managers who are not assigned to a specific unit.

Unit secretaries or clerks, monitor technicians, and other with no direct patient care responsibilities (Therapy assistants, student nurses who are fulfilling educational requirements, sitters who either are not employed by the facility or who are employed by the facility, but are not providing typical UAP activities).

Unlicensed Assistive Personnel (UAPs): Individuals trained to function in an assistive role to nurses in the provision of patient care, as delegated by and under the supervision of the registered nurse. Typical activities performed by UAPs may include (but are not limited to): taking vital signs, bathing, feeding, dressing patients, assisting patients with transfers, ambulation, or toileting.

Included UAPs: nursing assistants, orderlies, patient care technicians/assistants, graduate nurses (not yet licensed) who have completed unit orientation.

Mental Health Technicians (MHT): For Psychiatric In-Patient Units ONLY

Individuals functioning in an assistive role, for which your facility requires course work or training that is different from UAP. They may be licensed or unlicensed. MHT hours are included in UAP hours when reporting, but their hours are collected separately from UAP hours if persons in this job position also meet the following criteria:

- They are engaged in direct care activities greater than 50% time, and
- Their position is staffed 24/7 and replaced when they call in sick, and
- Their hours are included in the nursing staff budget

Data Elements:

RN hours (Employee) RN hours (Contract/Agency) LPN/LVN hours (Employee)

LPN/LVN hours (Contract/Agency) UAP hours (Employee) UAP hours (Contract/Agency) MHT hours (Employee) MHT hours (Contract/Agency) Year Month Type of Unit

# DENOMINATOR STATEMENT

Denominator is the total number of patient days for each in-patient unit during the calendar month. Patient days must be from the same unit in which nursing care hours are reported.

## DENOMINATOR DETAILS

Conceptually, a patient day is 24 hours, beginning the hour of admission. The operational definitions of patient days are described in the section labeled Patient Day Reporting Methods.

The total number of patient days for each in-patient unit is collected by the calendar month using one of patient day reporting methods.

With the growth in the number of short stay in-patient units, included patients are in-patient and short stay patients (i.e., variously called short stay, observation, or same day surgery patients who receive care on a reporting in-patient unit for less than 24 hours).

Four (4) Patient Days reporting methods are as follows:

Method 1-Midnight Census

This is adequate for units that have all in-patient admissions. It is the least accurate method for units that have both in-patient and short stay patients. At the end of the month, sum the daily midnight census counts (the number of patients on the unit at midnight each day).

Method 2-Midnight Census + Patient Days from Actual Hours for Short Stay Patients

This is an accurate method for units that have both in-patients and short stay patients. The short stay "days" should be reported separately from midnight census and will be summed by NDNQI to obtain patient days. The total daily hours for short stay patients should be summed for the month and divided by 24.

Method 3-Patient Days from Actual Hours

This is the most accurate method. An increasing number of facilities have accounting systems that track the actual time spent in the facility by each patient. Sum actual hours for all patients, whether in-patient or short stay, and divide by 24.

Method 4-Patient Days from Multiple Census Reports

Some facilities collect censuses multiple times per day (e.g., every 4 hours or each shift). This method has shown to be as accurate as Method 3. Patient days based on midnight and noon census have shown to be sufficient in adjusting for short stay patients. A sum of the daily average censuses can be calculated to determine patient days for the month on the unit.

For all patient day reporting methods, it is recommended that facilities consistently use the same method for a reporting unit over time. Each unit should report patient days using the method that most accurate for the nursing work load. For some hospitals in which the midnight

census may be the only available measure of patient census, units with short stay patients should use either Method 2 or Method 3, if feasible.

Data Elements:

Month

Year

Patient Days Reporting method

Type of Unit

Patient days from Midnight census

Patient days from actual hours (depending on method selected)

#### EXCLUSIONS

Patient days from some non-reporting unit types, such as Emergency Department, perioperative unit, and obstetrics, are excluded.

# **EXCLUSION DETAILS**

Patient days must be from the same unit as the nursing care hours.

Data regarding nursing care hours in some units (e.g., Emergency Department, peri-operative unit, and obstetrics) have not been collected. Patient days from these types of units are excluded.

#### **RISK ADJUSTMENT**

Other Each unit is stratified by unit type (e.g., critical care, step down, medical), which is not identical to risk, but may be related.

## STRATIFICATION

Stratification variables are patient population and unit type. Units are stratified by patient population first and then unit type based on acuity level, age, or type of service provided.

1. Patient population

1) Adult population: limited to units generally caring for patients over 16 years old.

2) Pediatric population: limited to units generally caring for patients under 18 years old.

3) Neonate population: limited to units caring for newborn infants.

4) Psychiatric population: units caring for patients with psychiatric disorders.

5) Rehabilitation population: limited to distinct acute rehabilitation units providing intensive therapy 5 days/week.

2. Unit types by population

1) Adult population

**Critical Care** 

Highest level of care, includes all types of intensive care units. Optional specialty designations include: Burn, Cardiothoracic, Coronary Care, Medical, Neurology, Pulmonary, Surgical and Trauma.

Step-Down

Limited to units that provide care for patients requiring a lower level of care than critical care units and higher level of care than provided on medical/surgical units. Examples include progressive care or intermediate care units. Telemetry alone is not an indicator of acuity level. Medical

Units that care for patients admitted to medical services, such as internal medicine, family practice, or cardiology. Optional specialty designations include: BMT (Bone Marrow Transplant), Cardiac, GI, Infectious Disease, Neurology, Oncology, Renal or Respiratory.

Surgical

Units that care for patients admitted to surgical services, such as general surgery, neurosurgery, or orthopedics. Optional specialty designations include: Bariatric, Cardiothoracic, Gynecology, Neurosurgery, Orthopedic, Plastic Surgery, Transplant or Trauma.

Medical-Surgical Combined

Units that care for patients admitted to either medical or surgical services. Optional specialty designations include: Cardiac, Neuro/Neurosurgery or Oncology.

#### Critical Access

A unit located in a Critical Access Hospital that cares for a combination of patients that may include critical care, medical-surgical, skilled nursing (swing bed) and/or obstetrics.

2) Pediatric population

Refer to Adult unit type descriptions for corresponding unit types.

Critical care

Step-Down

Medical

Surgical

Medical-Surgical Combined

3) Neonate population

The three unit types below (Level I, II, and III/IV) are based on the Guidelines for Perinatal Care, 5th Ed., which are used by state certification programs. Level I, II, and III/IV neonatal units are the highest level of infant care provided, and are specified by sequential level of acuity.

Well-baby Nursery

Level I Continuing Care

Level II Intermediate Care

Level III/IV Critical Care

4) Psychiatric population

Adult

Units caring for adult patients with acute psychiatric disorders.

Child/Adolescent

Units caring for children and/or adolescents, predominantly ages 2-18 years old, with acute psychiatric disorders.

Geripsych

Units caring for elderly patients with acute psychiatric disorders.

Other (Behavioral Health, Specialty, Multiple Psychiatric Unit Types)

**Behavioral Health** 

Units caring for individuals of any age with eating disorders or substance abuse (alcohol and drugs) diagnoses.

Specialty

Units caring for patients of any age with dual diagnoses (e.g., mental illness and mental retardation, or substance abuse and an additional mental illness diagnosis).

Multiple Psychiatric Unit Types

Units caring for patients that encompass 3 or more of the above unit types, but for which no one unit type comprises greater than 50% of the entire unit.

5) Rehabilitation population

Adult

Limited to units generally caring for rehab patients over 16 years old. Optional specialty designations include: Brain Injury/SCI, Cardiopulmonary, Neuro/Stroke and Orthopedic/Amputee Rehab units.

## Pediatric

Limited to units generally caring for rehab patients under 18 years old.

## TYPE SCORE

Rate/proportion better quality = higher score

## ALGORITHM

Eligible unit identified and selected; input patient days (including method) for each respective unit by month; input nursing care hours for each eligible staff category by month; then perform calculations to produce each of the quarter patient days and quarter nursing care hours by summing monthly values of the 3 months; then divide the quarterly nursing care hours by the quarterly patients days.

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# 2720 National Healthcare Safety Network (NHSN) Antimicrobial Use Measure

#### STEWARD

Centers for Disease Control and Prevention

# DESCRIPTION

This measure assesses antimicrobial use in hospitals based on medication administration data that hospitals collect electronically at the point of care and report via electronic file submissions to CDC's National Healthcare Safety Network (NHSN). The antimicrobial use data that are in scope for this measure are antibacterial agents administered to adult and pediatric patients in a specified set of ward and intensive care unit locations: medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only). The measure compares antimicrobial use that the hospitals report with antimicrobial use that is predicted on

the basis of nationally aggregated data. The measure is comprised of a discrete set of ratios, Standardized Antimicrobial Administration Ratios (SAARs), each of which summarizes observedto-predicted antimicrobial use for one of 40 antimicrobial agent-patient care location combinations. The SAARs are designed to serve as high value targets or high level indicators for antimicrobial stewardship programs (ASPs). SAAR values that are outliers are intended to prompt analysis of possible overuse, underuse, or inappropriate use of antimicrobials, subsequent actions aimed at improving the quality of antimicrobial prescribing, and impact evaluations of ASP interventions.

#### TYPE

Process

# DATA SOURCE

Paper Medical Records, Registry Data

## LEVEL

Facility

#### SETTING

Inpatient/Hospital

#### NUMERATOR STATEMENT

Days of antimicrobial therapy for antimicrobial agents administered to adult and pediatric patients in medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only).

#### NUMERATOR DETAILS

An antimicrobial day (also known as a day of therapy) is defined by any amount of a specific antimicrobial agent administered in a calendar day to a particular patient as documented in an electronic medication administration record (eMAR) and/or bar coding medication record (BCMA). All antimicrobial days for specified categories of antibacterial agents administered in specified patient care locations—adult and pediatric medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only)—are summed for each location across months and comprise the numerator data for the measure. The specified categories of antimicrobial agents are: 1) Broad spectrum antibacterial agents predominantly used for hospital-onset infections, 2) Broad spectrum antibacterial agents predominantly used for community-acquired infections, 3) Antibacterial agents predominately used for resistant Grampositive infections, 4) Narrow spectrum beta-lactam agents, 5) Antifungal agents predominantly used for invasive candidiasis, 6) Antibacterial agents posing the highest risk for CDI, 7) Azithromycin (pediatrics only), 8) All antibacterial agents.

See attached Table 1. NHSN Antimicrobial Use Measure proposal for lists and descriptions of patient care locations and antibacterial agent categories

#### DENOMINATOR STATEMENT

Days present for each patient care location—adult and pediatric medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only) is defined as the number of patients who were present for any portion of each day of a calendar month for each location. The day of admission, discharge, and transfer to and from locations are included in days present. All days present are summed for each location and month, and the aggregate sums for each location-month combination comprise the denominator data for the measure.

## DENOMINATOR DETAILS

See attached Table 1b. NHSN Antimicrobial Use Measure proposal for list and description of patient care locations included in the measure.

#### EXCLUSIONS

Hospital patient care locations other than adult and pediatric medical ICU, medical-surgical ICU, surgical ICU (adult only), medical ward, medical-surgical ward, surgical ward, general hematology-oncology ward (adult only), and step-down unit (adult only) are excluded from this measure.

#### **EXCLUSION DETAILS**

See Table 1b. NHSN Antimicrobial Use Measure for description of patient care locations. Listed locations are included in the measure; all other locations are excluded.

#### **RISK ADJUSTMENT**

Statistical risk model

#### STRATIFICATION

Antimicrobial use data is stratified by hospital-specific and patient care location-specific variables: hospital teaching status (major [medical school and post-graduate training], graduate only [residents and/or fellows], undergraduate only [medical students], not a teaching hospital); hospital bedsize; hospital ICU bedsize; percentage of ICU beds among total beds (number ICU beds/total number hospital beds); average length of hospital stay (number annual admissions/ number annual patient days); patient care location.

#### TYPE SCORE

Ratio better quality = score within a defined interval

## ALGORITHM

The Standardized Antimicrobial Administration Ratio (SAAR), the ratio of observed to predicted antimicrobial use, is a score that can be above, equal to, or below 1.0. A high score (above 1.0) that achieves statistical significance may indicate excessive antimicrobial use. A score that is not significantly different than 1.0 indicates antimicrobial use that is equivalent to the referent population's antimicrobial use. A low score (below 1.0) that achieves statistical significance may indicate antimicrobial use statistical significance may indicate antimicrobial use that is equivalent to the referent population's antimicrobial use. A low score (below 1.0) that achieves statistical significance may indicate antimicrobial under use.

Each SAAR is calculated as follows:

1. Identify the antimicrobial days reported for each patient care location included in the SAAR for the measurement period

2. Total each of these numbers for an observed number of antimicrobial days

3. Obtain the predicted antimicrobial days in the same patient care locations by multiplying the observed days present by the corresponding antimicrobial use rate in the standard population obtained from the relevant regression model

- 4. Sum the predicted antimicrobial days for the patient care locations included in the SAAR
- 5. Divide the total number of antimicrobial days by the predicted number of antimicrobial days
- 6. Result = SAAR

A discrete set of SAARs comprise the antimicrobial use measure: SAARs that are intended to serve as high value targets for antimicrobial stewardship programs and SAARs that are intended to serve as high level indicators of all antimicrobial use across multiple patient care locations.

High value targets – SAARs for 38 different antibacterial agent-patient care location combinations (24 adult, 14 pediatric)

# Adult

1. Broad spectrum antibacterial agents predominantly used for hospital-onset infections – adult medical, medical-surgical, and surgical intensive care units

2. Broad spectrum antibacterial agents predominantly used for hospital-onset infections – adult medical, medical-surgical, and surgical wards

3. Broad spectrum antibacterial agents predominantly used for hospital-onset infections – adult general hematology-oncology wards

4. Broad spectrum antibacterial agents predominantly used for hospital-onset infections – adult step-down units

5. Broad spectrum antibacterial agents predominantly used for community-acquired infections – adult medical, medical-surgical, and surgical intensive care units

6. Broad spectrum antibacterial agents predominantly used for community-acquired infections – adult medical, medical-surgical, and surgical wards

7. Broad spectrum antibacterial agents predominantly used for community-acquired infections – adult general hematology-oncology wards

8. Broad spectrum antibacterial agents predominantly used for community-acquired infections – adult step-down units

9. Antibacterial agents predominantly used for resistant Gram-positive infections – adult medical, medical-surgical, and surgical intensive care units

10. Antibacterial agents predominantly used for resistant Gram-positive infections – adult medical, medical-surgical, and surgical wards

11. Antibacterial agents predominantly used for resistant Gram-positive infections – adult general hematology-oncology wards

12. Antibacterial agents predominantly used for resistant Gram-positive infections – adults stepdown units

13. Narrow spectrum beta-lactam agents – adult medical, medical-surgical, and surgical intensive care units

14. Narrow spectrum beta-lactam agents – adult medical, medical-surgical, and surgical wards

15. Narrow spectrum beta-lactam agents – adult general hematology-oncology wards

16. Narrow spectrum beta-lactam agents – adult step-down units

17. Antibacterial agents posing highest risk for CDI – adult medical, medical-surgical, and surgical intensive care units

18. Antibacterial agents posing highest risk for CDI – adult medical, medical-surgical, and surgical wards

19. Antibacterial agents posing highest risk for CDI – adult general hematology-oncology wards

20. Antibacterial agents posing highest risk for CDI – adult step-down units

21. Antifungal agents predominantly used for invasive candidiasis – adult medical, medicalsurgical, and surgical intensive care units

22. Antifungal agents predominantly used for invasive candidiasis – adult medical, medicalsurgical, and surgical wards

23. Antifungal agents predominantly used for invasive candidiasis – adult general hematologyoncology wards

24. Antifungal agents predominantly used for invasive candidiasis – adult step-down units

#### Pediatric

1. Broad spectrum antibacterial agents predominantly used for hospital-onset infections – pediatric medical and medical-surgical intensive care units

 Broad spectrum antibacterial agents predominantly used for hospital-onset infections – pediatric medical, medical-surgical, and surgical wards

3. Broad spectrum antibacterial agents predominantly used for community-acquired infections – pediatric medical and medical-surgical intensive care units

4. Broad spectrum antibacterial agents predominantly used for community-acquired infections – pediatric medical, medical-surgical, and surgical wards

5. Antibacterial agents predominantly used for resistant Gram-positive infections – pediatric medical and medical-surgical intensive care units

6. Antibacterial agents predominantly used for resistant Gram-positive infections – pediatric medical, medical-surgical, and surgical wards

7. Narrow spectrum beta-lactam agents – pediatric medical and medical-surgical intensive care units

8. Narrow spectrum beta-lactam agents – pediatric medical, medical-surgical, and surgical wards

9. Azithromycin – pediatric medical and medical-surgical intensive care units

10. Azithromycin – pediatric medical, medical-surgical, and surgical wards

11. Antibacterial agents posing highest risk for CDI – pediatric medical and medical-surgical intensive care units

12. Antibacterial agents posing highest risk for CDI – pediatric medical, medical-surgical, and surgical wards

13. Antifungal agents predominantly used for invasive candidiasis – pediatric medical and medical-surgical intensive care units

14. Antifungal agents predominantly used for invasive candidiasis – pediatric medical, medicalsurgical, and surgical wards

High level indicators – SAARs for 2 different antibacterial agent-patient care location combinations

# Adult

1. All antibacterial agents – adult medical, medical-surgical, and surgical intensive care units and wards, general hematology-oncology wards, step-down units

# Pediatric

1. All antibacterial agents – pediatric medical intensive care units and wards, medical-surgical intensive care units and wards, and surgical wards

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## 2726 Prevention of Central Venous Catheter (CVC)-Related Bloodstream Infections

# STEWARD

American Society of Anesthesiologists

## DESCRIPTION

Percentage of patients, regardless of age, who undergo central venous catheter (CVC) insertion for whom CVC was inserted with all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques followed

## TYPE

Process

# DATA SOURCE

Registry Data Measure data was collected from the Anesthesia Quality Institute (AQI) National Anesthesia Clinical Outcomes Registry (NACOR).

# LEVEL

Clinician : Group/Practice, Clinician : Individual

#### SETTING

Inpatient/Hospital

## NUMERATOR STATEMENT

Patients for whom central venous catheter (CVC) was inserted with all elements of maximal sterile barrier technique\*, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques\*\* followed

Definitions:

\*Maximal sterile barrier technique includes ALL of the following elements:

- cap
- mask
- sterile gown
- sterile gloves
- sterile full body drape
- \*\* Sterile ultrasound techniques require sterile gel and sterile probe covers

#### NUMERATOR DETAILS

Performance Met: CPT<sup>®</sup> II Code: 6030F- All elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques followed

Denominator Exception: CPT<sup>®</sup> II Code: 6030F-1P- Documentation of medical reason(s) for not following all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques during CVC insertion (including increased risk of harm to patient if adherence to aseptic technique would cause delay in CVC insertion).

Performance Not Met: CPT<sup>®</sup> II Code: 6030F-8P- All elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques not followed, reason not otherwise specified.

#### DENOMINATOR STATEMENT

All patients, regardless of age, who undergo CVC insertion

#### DENOMINATOR DETAILS

Patient procedure during the performance period (CPT): 36555, 36556, 36557, 36558, 36560, 36561, 36563, 36565, 36566, 36568, 36569, 36570, 36571, 36572, 36573, 36578, 36580, 36581, 36582, 36583, 36584, 36585, 93503

## EXCLUSIONS

#### None

The measure includes a denominator exception as indicated by reporting 6030F-1P for the numerator: Documentation of medical reason(s) for not following all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques during CVC insertion (including increased risk of harm to patient if adherence to aseptic technique would cause delay in CVC insertion)

#### **EXCLUSION DETAILS**

#### NA

The measure includes denominator exception as indicated by reporting 6030F-1P for the numerator: Documentation of medical reason(s) for not following all elements of maximal sterile barrier technique, hand hygiene, skin preparation and, if ultrasound is used, sterile ultrasound techniques during CVC insertion (including increased risk of harm to patient if adherence to aseptic technique would cause delay in CVC insertion)

#### **RISK ADJUSTMENT**

No risk adjustment or risk stratification

#### STRATIFICATION

The measure is not stratified.

#### TYPE SCORE

Rate/proportion better quality = higher score

## ALGORITHM

1. Start with Denominator

2. Check Procedure Performed:

a. If Procedure as Listed in the Denominator equals No, do not include in Eligible Population. Stop

Processing.

b. If Procedure as Listed in the Denominator equals Yes, include in the Eligible Population.

- 3. Denominator Population:
- a. Denominator Population is all Eligible Procedures in the Denominator.
- 4. Start Numerator

5. Check All Elements of Maximal Sterile Barrier Technique Followed:

a. If All Elements of Maximal Sterile Barrier Technique Followed equals Yes, include in Data Completeness Met and Performance Met.

b. If All Elements of Maximal Sterile Barrier Technique Followed equals No, proceed to check Documentation of Medical Reasons for All Elements of Maximal Sterile Barrier Technique Not Followed.

6. Check Documentation of Medical Reasons for All Elements of Maximal Sterile Barrier Technique Not Followed:

a. If Documentation of Medical Reasons for All Elements of Maximal Sterile Barrier Technique Not Followed equals Yes, include in Data Completeness Met and Denominator Exception.

b. If Documentation of Medical Reasons for All Elements of Maximal Sterile Barrier Technique Not Followed equals No, proceed to check All Elements of Maximal Sterile Barrier Technique Not Followed, Reason Not Otherwise Specified.

7. Check All Elements of Maximal Sterile Barrier Technique Not Followed, Reason Not Otherwise Specified:

a. If All Elements of Maximal Sterile Barrier Technique Not Followed, Reason Not Otherwise Specified equals Yes, include in the Data Completeness Met and Performance Not Met.

b. If All Elements of Maximal Sterile Barrier Technique Not Followed, Reason Not Otherwise Specified equals No, proceed to check Data Completeness Not Met.

8. Check Data Completeness Not Met:

a. If Data Completeness Not Met, the Quality Data Code or equivalent was not submitted.

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# 3498e Hospital Harm - Pressure Injury

#### STEWARD

Centers for Medicare and Medicaid Services (CMS)

#### DESCRIPTION

This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients ages 18 years and older who develop a new stage 2, stage 3, stage 4 pressure injury, deep tissue pressure injury, or unstageable pressure injury during hospitalization.

# түре

Outcome

#### DATA SOURCE

Electronic Health Records Hospitals collect EHR data using certified electronic health record technology (CEHRT). The MAT output, which includes the human readable and XML artifacts of the clinical quality language (CQL) for the measure are contained in the eCQM specifications attached. No additional tools are used for data collection for eCQMs.

# LEVEL

Facility

#### SETTING

Inpatient/Hospital

#### NUMERATOR STATEMENT

The number of hospital inpatient admissions during which a patient developed a new stage 2, stage 3, stage 4 pressure injury, deep tissue pressure injury, or unstageable pressure injury that was not documented as present in the first 24 hours of hospital arrival.

## NUMERATOR DETAILS

This is an eCQM, and therefore uses electronic health record data to calculate the measure score. The time period for data collection is during an inpatient hospitalization, beginning at hospital arrival (whether through Emergency Department, observation stay, or directly admitted as inpatient). All data elements necessary to calculate this measure are defined within value sets, described below and available in the VSAC.

Pressure ulcer stage is defined by the VSAC as Pressure Ulcer Stage (2.16.840.1.113883.11.20.9.35).

To access the value sets for the measure, please visit the Value Set Authority Center (VSAC), sponsored by the National Library of Medicine, at https://vsac.nlm.nih.gov/.

## DENOMINATOR STATEMENT

All patients 18 years or older at the start of the encounter and discharged inpatient hospital admission during the measurement period. The measure includes inpatient admissions which began in the Emergency Department or in observational status.

#### DENOMINATOR DETAILS

This measure includes all inpatient admissions for patients aged 18 years and older at the time of admission, and all payers. Measurement period is one year. This measure is at the hospital-by-admission-level; only one numerator event is counted per admission.

Inpatient Encounters are represented using the value set of Encounter Inpatient (2.16.840.1.113883.3.666.5.307).

Emergency Department visits are represented using the value set of Emergency Department Visit (2.16.840.1.113883.3.117.1.7.1.292).

Patients whom had observation encounters are represented using the value set of Observation Services (2.16.840.1.113762.1.4.1111.143).

To access the value sets for the measure, please visit the Value Set Authority Center (VSAC), sponsored by the National Library of Medicine, at https://vsac.nlm.nih.gov/.

#### EXCLUSIONS

There are no denominator exclusions.

#### **EXCLUSION DETAILS**

N/A; there are no denominator exclusions.

## **RISK ADJUSTMENT**

No risk adjustment or risk stratification

#### STRATIFICATION

N/A; this measure is not stratified.

## TYPE SCORE

Rate/proportion better quality = lower score

#### ALGORITHM

Target population

Inpatient admission encounters, all payer, where individuals are aged 18 years or older at the start of the admission and are discharged within the measurement period.

To create the denominator:

1. If the inpatient admission was during the measurement period, go to Step 2. If not, do not include in measure population.

2. Determine the patient's age in years. The patient's age is equal to the admission date minus the birth date. If the patient is 18 years or older, include in the measure population. If less than 18 years old, do not include in the measure population.

To create the numerator:

1. Of encounters in the denominator, include any qualifying inpatient admissions which include a stage 2, stage 3, stage 4, deep tissue pressure injury, or unstageable pressure injury that was not documented within first 24 hours after hospital arrival.

2. Of the events, keep one (the first) qualifying event per encounter. This measure counts one harm per encounter.

See algorithm flowchart attached as appendix.

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# 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

## STEWARD

Centers for Medicare & Medicaid Services (CMS)

#### DESCRIPTION

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added

by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

- Dataset used for development, some testing (see below for differences), and measure results:
  - a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
  - b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.
- 7. Difference between the two measures when fully harmonized, prior to implementation:
- 8. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

TYPE

Outcome

#### DATA SOURCE

Claims, Electronic Health Records, Other Clinical-Hybrid Dataset

Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).

The two data sources listed below were used for testing the claims-based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).

HWM claims-only datasets:

Medicare Part A Inpatient Claims Data

The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.

Medicare Enrollment Database (EDB)

This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

#### LEVEL

Facility

#### SETTING

Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services

#### NUMERATOR STATEMENT

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

#### NUMERATOR DETAILS

The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

#### DENOMINATOR STATEMENT

The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

#### DENOMINATOR DETAILS

The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

#### 2. Aged between 50 and 94 years

The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.

#### 3. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

#### 4. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal

6. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

8. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

#### EXCLUSIONS

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;

2. Discharged against medical advice (AMA);

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

#### **EXCLUSION DETAILS**

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.

Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

#### **RISK ADJUSTMENT**

Statistical risk model

#### **STRATIFICATION**

N/A

#### TYPE SCORE

Rate/proportion better quality = lower score

#### ALGORITHM

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio

indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

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#### 3503e Hospital Harm – Severe Hypoglycemia

#### STEWARD

Centers for Medicare & Medicaid Services (CMS)

#### DESCRIPTION

This electronic clinical quality measure (eCQM) assesses the proportion of inpatient admissions for patients aged 18 years and older who received at least one antihyperglycemic medication during their hospitalization, and who suffered a severe hypoglycemic event (blood glucose less than 40 mg/dL) within 24 hours of the administration of an antihyperglycemic agent.

#### TYPE

Outcome

#### DATA SOURCE

Electronic Health Records Hospitals collect EHR data using certified electronic health record technology (CEHRT). The MAT output, which includes the human readable and XML artifacts of the clinical quality language (CQL) for the measure are contained in the eCQM specifications attached. No additional tools are used for data collection for eCQMs.

#### LEVEL

Facility

#### SETTING

Inpatient/Hospital

#### NUMERATOR STATEMENT

The number of inpatient admissions during which a test for blood glucose with a result less than 40 mg/dL (severe hypoglycemia) where the event follows the administration of an antihyperglycemic medication within 24 hours.

#### NUMERATOR DETAILS

This is an eCQM, and therefore uses electronic health record data to calculate the measure score. The time period for data collection is during an inpatient hospitalization, beginning at

hospital arrival (whether through Emergency Department, observation stay, or directly admitted as inpatient).

All data elements necessary to calculate this measure are defined within value sets available in the VSAC, and listed below.

Glucose tests are represented by LOINC Codes in the value set Glucose Lab Test (2.16.840.1.113762.1.4.1045.134). Codes include both laboratory and point-of-care glucose tests, including venous or arterial blood and serum or plasma.

The antihyperglycemic medications are defined by the value set of Hypoglycemics (2.16.840.1.113762.1.4.1179.3). This value set includes medications and insulin capable of causing hypoglycemia in a patient.

To access the value sets for the measure, please visit the Value Set Authority Center (VSAC), sponsored by the National Library of Medicine, at https://vsac.nlm.nih.gov/.

#### DENOMINATOR STATEMENT

All patients 18 years or older at the start of the encounter with a discharged inpatient hospital admission during the measurement period who were given at least one antihyperglycemic medication during their hospital stay. The measure includes inpatient admissions which began in the Emergency Department or in observation status.

#### DENOMINATOR DETAILS

This measure includes all encounters aged 18 years and older at the time of admission, and all payers. Measurement period is one year. This measure is at the hospital-by-admission level; only one numerator event is counted per admission.

Inpatient Encounters are represented using the value set of Encounter Inpatient (2.16.840.1.113883.3.666.5.307).

Emergency Department visits are represented using the value set of Emergency Department Visit (2.16.840.1.113883.3.117.1.7.1.292).

Patients who had observation encounters are represented using the value set of Observation Services (2.16.840.1.113762.1.4.1111.143).

Encounters who were given at least one antihyperglycemic medication are defined by the value set of Hypoglycemics (2.16.840.1.113762.1.4.1179.3), which also defines the numerator medications. This value set includes medications and insulin capable of causing hypoglycemia in a patient.

To access the value sets for the measure, please visit the Value Set Authority Center, sponsored by the National Library of Medicine, at https://vsac.nlm.nih.gov/.

#### EXCLUSIONS

N/A, there are no denominator exclusions.

#### EXCLUSION DETAILS

N/A

#### **RISK ADJUSTMENT**

No risk adjustment or risk stratification

#### STRATIFICATION

N/A; this measure is not stratified.

#### TYPE SCORE

Rate/proportion better quality = lower score

#### ALGORITHM

Target population: Inpatient admission encounters, all payer, where individuals are aged 18 years or older at the start of the admission and who were given at least one antihyperglycemic medication during their hospital stay, within the measurement period.

To create the denominator:

1. If the inpatient admission was during the measurement period, go to Step 2. If not, do not include in measure population.

2. Determine the patient's age in years. The patient's age is equal to the admission date minus the birth date. If the patient is 18 years or older, go to Step 3. If less than 18 years old, do not include in the measure population.

3. Determine if there was at least one antihyperglycemic medication (from the Hypoglycemic value set 2.16.840.1.113762.1.4.1179.3) administered during the inpatient hospitalization (including in the Emergency Department or observation stay if later converted into an inpatient admission). If not, do not include in the measure population.

To create the numerator, for each encounter identify:

1. Any instance of a test for blood glucose with a result less than 40 mg/dL during the encounter is considered a severe hypoglycemic event, including values from either laboratory or Point of Care (POC) testing.

2. For any value less than 40mg/dL, determine if there was an antihyperglycemic medication administered by hospital staff within the 24 hours before the event and during the hospitalization (including emergency department and observation stays contiguous with the admission). If not, do not include in the numerator.

a. The 24-hour time frame extends from the end of the medication administration to the start of the blood glucose test.

3. For any value less than 40mg/dL, do not include any events (identified in Step 1) if it was followed by a repeat POC test for blood glucose within 5 minutes of the initial test and with a result greater than 80 mg/dL.

a. Rationale: The measure logic does –not– require a repeat blood glucose test to be performed. The expectation is that in most cases of severe hypoglycemia, the clinical team will be treating the patient and will not immediately repeat the test. However, if the severe hypoglycemic event is suspected to be spurious, for example if the patient is clinically asymptomatic, and a repeat test is performed to confirm that suspicion, this step will remove false positives that can occur in POC testing to ensure hospitals are not penalized for erroneous results. The 5-minute time frame extends from the time that the initial blood glucose test was performed to the time that the repeat blood glucose test was performed.

Only the first qualifying severe hypoglycemic event is counted in the numerator, and only one severe hypoglycemic event is counted per encounter.

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# 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

#### STEWARD

Centers for Medicare & Medicaid Services (CMS)

#### DESCRIPTION

The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

- 1. Dataset used for development, some testing (see below for differences), and measure results:
  - a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
  - b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
- 2. Age of patients in cohort:
  - a. The claims-only measure includes Medicare FFS patients, age 65-94.
  - b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing

- a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 4. Socioeconomic risk factor analyses
  - a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
- 5. Exclusion analyses
  - To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
- 6. Meaningful differences
  - a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.
- 7. Difference between the two measures when fully harmonized, prior to implementation:
- 8. Risk adjustment:
  - a. The claims-only measure uses administrative claims data only for risk adjustment
  - b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

#### TYPE

Outcome

#### DATA SOURCE

Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:

1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

#### LEVEL

Facility

#### SETTING

Inpatient/Hospital

#### NUMERATOR STATEMENT

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

#### NUMERATOR DETAILS

The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

#### DENOMINATOR STATEMENT

The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

#### DENOMINATOR DETAILS

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission

Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.

Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

3. Aged between 65 and 94 years

Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.

Note that the hybrid measure (submitted for NQF endorsement in parallel with the claims-only measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

4. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.

7. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

9. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

#### EXCLUSIONS

The measure excludes index admissions for patients:

- 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
- 2. Discharged against medical advice (AMA);
- With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
- 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

#### **EXCLUSION DETAILS**

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data

Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240)

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

#### **RISK ADJUSTMENT**

Statistical risk model

#### **STRATIFICATION**

N/A

#### TYPE SCORE

Rate/proportion better quality = lower score

#### ALGORITHM

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of

"predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

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# Appendix E1: Related and Competing Measures (tabular format)

## Comparison of NQF 3502, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530

	3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All
	Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
4	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services	Centers for Medicare & Medicaid Services
escription			A Medicald Services The measure estimates a hospital- level risk-standardized complication rate (RSCR) associated with elective primary THA and TKA in Medicare Fee-For-Service beneficiaries who are 65 years and older. The outcome (complication) is defined as any one of the specified complications occurring from the date of index admission to 90 days post date of the index admission included in the measure cohort). The target population is patients 18 and over. CMS annually reports the measure for patients who are 65 years or older, are enrolled in fee-for- service (FFS) Medicare, and hospitalized in non- federal acute-care hospitals.		Medicaid Services This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD. Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are Medicare fee-for-service (FFS) beneficiaries hospitalized in non- federal acute care hospitals	The measure estimates hospital-level, risk- standardized mortality rate (RSMR) for patients discharged from the hospital following a qualifying isolated CABC procedure. Mortality is defined as death from any cause within 30 day of the procedure date o an index CABG admissio An index CABG admissio is the hospitalization for qualifying isolated CABC procedure considered for the mortality outcome. The measure was developed using Medicare Fee-for-Servic (FFS) patients 65 years and older and was teste in all-payer patients 18 years and older.

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition, All-Procedure) Risk-	All-Cause Unplanned Readmission Measure	risk-standardized complication rate	all-cause, risk- standardized mortality	all-cause, risk- standardized mortality	Cause, Risk-Standardized Mortality Rate (RSMR)
Standardized	(HWR)	(RSCR) following	rate (RSMR) following	rate (RSMR) following	Following Coronary
Mortality Measure		elective primary total hip arthroplasty (THA)	pneumonia hospitalization	chronic obstructive pulmonary disease	Artery Bypass Graft (CABG) Surgery
		and/or total knee		(COPD) hospitalization	
1. Dataset used	facility-level RSRR of	arthroplasty (TKA)			
for development,	unplanned, all-cause				
some testing (see below for differences),	readmission after admission for any				
and measure results:	eligible condition				
a. The claims- only measure uses	within 30 days of hospital discharge.				
nation-wide Medicare	The ACR measure is				
FFS claims and the enrollment database.	calculated using the same five specialty				
b. The hybrid	cohorts and estimates				
measure uses an electronic health	an ACO-level standardized risk ratio				
record (EHR) database	for each. CMS				
from 21 hospitals in the Kaiser	annually reports the measure for patients				
Permanente network	who are 65 years or				
which includes inpatient claims data	older, are enrolled in FFS Medicare and are				
information.	ACO assigned				
<ol><li>Age of patients in cohort:</li></ol>	beneficiaries.				
a. The claims-					
only measure includes Medicare FFS patients,					
age 65-94.					
b. The hybrid measure includes all					
patients age 50-94					
(see later discussion for justification)					
3. External					
empiric validity testing					
a. Not possible for the hybrid					
measure, due to limited data					
availability. We					
provide results from the claims-only					
measure within the					
hybrid testing form. 4.					
Socioeconom					
ic risk factor analyses a. Not possible					
for the hybrid					
measure, due to limited data					
availability. We					
provide results from the claims-only					
measure within the					
hybrid testing form. 5. Exclusion					
analyses					
a. To be representative of					
what we expect the					
impact would be of the measures'					
exclusions in a nation-					
wide sample, we provide the results					
from the claims-only measure.					
6. Meaningful					
differences					
a. To be representative of					
what we expect the					
range of performance would be in a nation-					
wide sample, we provide the					
distribution results					
from the claims-only measure.					
Difference between					
the two measures when fully					
when rully			<u> </u>	1	

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	harmonized, prior to implementation: 1. Risk adjustment: a. The claims- only measure uses administrative claims data only for risk adjustment b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.					
Туре	Outcome	Outcome	Outcome	Outcome	Outcome	Outcome
	Clinical-Hybrid Dataset Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the	measure: HWR 1. Medicare Part A claims data for calendar years 2007 and 2008 were combined and then randomly split into two equal subsets (development sample and validation sample). Risk variable selection was done using the development sample, the risk models for each of the five specialty cohorts in the measure were applied to the validation sample and the models' performance was compared. In addition	sources: The currently publically reported measure is specified and has been tested using: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. 2. Medicare Enrollment Database	sources for the Medicare FFS measure: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. 2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and	sources for the Medicare FFS measure: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. 2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information.	measure: Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on
	attached methodology report). The two data sources listed below were used for testing the claims-based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses). HWM claims-only datasets:	we re-tested the models in Medicare Part A claims data from calendar year 2009 to look for temporal stability in the models' performance. The number of measured entities and index admissions are listed below by specialty cohort. 2. Medicare Enrollment Database (EDB): This database contains Medicare	(EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status at discharge. These data have previously been	vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). 3. The American Community Survey (2008-2012): The	This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). 3. The American Community Survey (2008-2012): The American Community Survey data is collected	several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). The American Communit Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the

HWM claims-only datasets: Medicare Part A Inpatient Claims Data The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the

(EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission and following discharge from index admission ACR 1. Medicare Part A claims data for calendar years 2013, 2014, and 2015.

have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). During original measure development we validated the administrative claimsbased definition of THA/TKA complication (original model specification) against a medical record data. 3. Data abstracted from medical records from eight participating hospitals (approximately 96 records per hospital; 644 total records) for

**Community Survey** (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES composite index score. 4. Data sources for the all-payer update: For our analyses to examine use in allpayer data, we used allpayer data from California in addition to CMS data for Medicare FFS patients aged 65 years or over (65+) in California hospitals. California is a diverse state, and, with more

American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES composite index score. 4. Data sources for the all-payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital

aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score. Data sources for the all-

payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the **California Patient** Discharge Data, a large linked database of patient hospital admissions. In 2006, there were approximately 3 million

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Medicare Enrollment Database (EDB) for testing the claims- based measure. Medicare Enrollment Database (EDB) This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment. No data collection instrument provided Attachment Del18b2HOP5HWMHy bridDataDictionary010 72019.xlsx	2. Medicare Enrollment Database (EDB). Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91. Available in attached appendix at A.1 Attachment NQF_1789_NQF_Data _Dictionary_05-26- 17_v1.0.xlsx	Medicare beneficiaries over the age of 65 years who had a qualifying THA/TKA procedure between January 1 2007 and December 31, 2008. The measure was also specified and testing using an all-payer claims dataset although it is only publically reported using the data sources listed above 4. California Patient Discharge Data is a large, linked database of patient hospital admissions in the state of California. Using all-payer data from California, we performed analyses to determine whether the THA/TKA complication measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 years or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission. Additional Data source used for analysis of the impact of SES variables on the measure's risk model. Note, the variables derived from these data are not included in the measure as specified 5. The American Community Survey (2009-2013): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score. Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Vetersials. Medical: Carr. 1912; 30(5): 371-91. Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score. Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Vetersials. Medical: Carr. 1992; 30(5): 371-91. Survey data is collected annually and an dyr potal Knee Arthroplasty (TKA)	than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2009, there were 3,193,904 adult discharges from 446 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records). Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the pneumonia mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377- 91. No data collection instrument provided Attachment NQF_0468_Pneumonia _Mortality_Data_Dictio nary_09-26-17_v1.0.xls	admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non- Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records). Using all-payer data from California, we performed analyses to determine whether the COPD mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377- 91. No data collection instrument provided Attachment NQF_1893_COPD_Mortal ity_NQF_Data_Dictionary _v1.0_091818_kl.xlsx	adult discharges from more than 450 non- Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records). Using all-payer data from California, we performed analyses to determine whether the HF readmission measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 years or older, but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference: Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91. No data collection instrument provided Attachment NQF_25S8_CABG_Mortali ty_Data_Dictionary_12- 30-16_v1.0.xlsx

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) Risk-Standardized Complication Measure (Version 3.0). 2014 No data collection instrument provided Attachment NQF_1550_HipKnee_C	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Level	Facility	Facility, Integrated	omplication_Data_Dic tionary_v1.0.xlsx Facility	Facility	Facility	Facility
		Delivery System	-			
Setting	Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services	Inpatient/Hospital, Outpatient Services	Inpatient/Hospital	Inpatient/Hospital	Inpatient/Hospital	Inpatient/Hospital
Numerator Statement	The outcome for this measure is 30-day, all- cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.	The outcome for the HWR measure is 30- day readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions, within 30 days from the date of discharge from an eligible index admission. If a patient has more than one unplanned admission (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. The measure looks for a dichotomous yes or no outcome of whether each admitted patient has an unplanned readmission within 30 days. However, if the first readmission after discharge is considered planned, any subsequent unplanned readmission is not counted as an outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission. The outcome for the ACR measure is also 30-day readmission. The outcome is defined identically to what is described above for the HWR measure.	The outcome for this measure is any complication occurring during the index admission (not coded present on arrival) to 90 days post-date of the index admission. Complications are counted in the measure only if they occur during the index hospital admission or during a readmission. The complication outcome is a dichotomous (yes/no) outcome. If a patient experiences one or more of these complications in the applicable time period, the counted in the measure as a "yes".	The outcome for this measure is 30-day, all- cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia, or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary discharge diagnosis of severe sepsis. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30-day, all- cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with either a principal discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30-day all- cause mortality. Mortality is defined as death for any reason within 30 days of the procedure date from the index admission for patients 18 and older discharged from the hospital after undergoing isolated CABG surgery.
Numerator Details	The measure outcome is death from any cause within 30 days of the admission date of the index	The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of	The composite complication is a dichotomous outcome (yes for any complication(s); no for	This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged	Outcome definition This measure counts death from any cause within 30 days of the index admission date.	In the current publicly reported measure, we identify deaths for Medicare FFS patients 65 years or older in the

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
		and/or total knee arthroplasty (TKA)		(COPD) hospitalization	
admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.	discharge of the index admission, excluding planned readmissions as defined below. Planned Readmission Algorithm (Version 4.0) The Planned Readmission Algorithm is a set of criteria for classifying readmissions as planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital. The Planned Readmission Algorithm has three fundamental principles: 1. A few specific, limited types of care are always considered planned (obstetric delivery, transplant surgery, maintenance chemotherapy/immun otherapy, rehabilitation); 2. Otherwise, a planned readmission is defined as a non- acute readmission for a scheduled procedure; and 3. Admissions for acute illness or for complications of care are never planned. The algorithm was developed in 2011 as part of the Hospital- Wide Readmission measure. In 2013, CMS applied the algorithm to its other readmission measures. The Planned Readmission Algorithm and associated code tables are attached in data field S.2b (Data Dictionary or Code Table).	arthroplasty (TKA) no complications). Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes". Complications are counted in the measure only if they occur during the index hospital admission (and are not present on admission) or during a readmission. The complications captured in the numerator are identified during the index admission OR associated with a readmission up to 90 days post-date of index admission, depending on the complications from date of index admission is as follow-up period for complications from date of index admission because these conditions are more likely to be attributable to the procedure if they occur within the first week after the procedure. Additionally, analyses indicated a sharp decrease in the rate of these complications after seven days. Death, surgical site bleeding, and pulmonary embolism are followed for 30 days following admission because clinical experts agree these complications after seven days. Death, surgical site bleeding, and pulmonary embolism are followed for 30 days following admission because clinical experts agree these complications after seven days. Death, surgical site bleeding, and pulmonary embolism are followed for 30 days following admission because clinical experts agree these complications are still likely attributable to the hospital performing the procedure during this period and rates for these complications and perjector experts agree these complications are still likely attributable to the hospital performing the procedure during this period and rates for these complications and perjector experts agree these complications and perjector experts agree these complicatio	from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA). Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee- for-service (FFS) beneficiaries and hospitalized in non- federal acute care hospitals.	Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and appropriate transition to the non- acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2018; Dharmarajan et al., 2015). Identifying deaths in the Medicare FFS population As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB). Reference: 1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. http://www.qualitynet.o rg/dcs/ContentServer?c= Page&pagename=QnetP ublic/Page/QnetTier3&ci d=1163010421830. Accessed June 6, 2018. 2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411	Medicare Enrollment Database (EDB). Outcome Attribution: Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves a qualifying isolated CABG procedure is as follows: 1) If a patient undergoes a CABG procedure in the first hospital and is then transferred to a second hospital where there is no CABG procedure, the mortality outcome is attributed to the first hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure. Rationale: A transfer following CABG is most likely due to a complication of the index procedure and that care provided by the hospital performing the CABG procedure likely dominates mortality risk even among transferred patients. 2) If a patient is admitted to a first hospital but does not receive a CABG procedure there and is then transferred to a second hospital where a CABG is performing the index CABG procedure. Rationale: Care provided by the hospital performing the CABG procedure there and is then transferred to a second hospital where a CABG is performed, the mortality outcome is attributed to the second hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure. Rationale: Care provided by the hospital performing the CABG procedure likely dominates mortality risk. 3) If a patient undergoes a CABG procedure is performed, the mortality outcome is attributed to the first hospital and is transferred to a second hospital where another CABG procedure is performed, the mortality outcome is attributed to the first hospital performing the index (first) CABG is most likely due to a complication of the index procedure, and tera sfer following CABG is most likely due to a complication of the index (first) CABG procedure. Rationale: A transfer following the index (ABG procedure likely dominates mortality risk even amot; transferred patients.

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
			up to 90 days following THA/TKA. The measure counts all complications occurring during the index admission regardless of when they occur. For example, if a patient experiences an AMI on day 10 of the index admission, the measure will count the AMI as a complication, although the specified follow-up period for AMI is seven days. Clinical experts agree with this approach, as such complications likely represent the quality of care provided during the index admission. As of 2014 reporting, the measure does not count complications in the complications outcome that are coded as POA during the index admission; this prevents identifying a condition as a complication of care if it was present on admission for the THA/TKA procedure. For full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheet "Complication Codes ICD9-ICD10".			
Denominato r Statement	The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for	The measure at the hospital level includes admissions for Medicare beneficiaries who are 65 years and older and are discharged from all non-federal, acute care inpatient US hospitals (including territories) with a complete claims history for the 12 months prior to	The target population for the publically reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing elective primary THA and/or TKA procedures. Additional details are provided in S.9 Denominator Details.	This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups. The cohort includes admissions for patients aged 18 years and older discharged from the hospital with a principal	This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older. We have tested the measure in both age groups. The cohort includes admissions for patients discharged from the hospital with either a principal discharge	This claims-based measure can be used in either of two patient cohorts: (1) patients age 65 years or older or (2) patients aged 18 years of older. We have tested th measure in both age groups. The cohort includes admissions for patients who receive a qualifying isolated CABG procedur (see the attached Data

inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claimsonly measure, so that both will include admissions for patients age 65-94.

The measure at the ACO level includes all relevant admissions for ACO assigned beneficiaries who are 65 and older and are discharged from all non-Federal short-stay acute care hospitals, including critical access hospitals. Additional details are provided in S.9

Denominator Details.

hospital with a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA, and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years

and older who are

rincipal discharge diagnosis of COPD, or a principal discharge diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD; and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non-federal hospitals Additional details are provided in S.7 Denominator Details.

Dictionary) and with a complete claims history for the 12 months prior to admission. CMS publicly reports this measure for those patients 65 years or older who are Medicare FFS beneficiaries admitted to non-federal hospitals. If a patient has more than one qualifying isolated CABG admission in a year, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Denominato r Details	The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.) An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients: 1. Not transferred from another acute care facility Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization to which the mortality outcome is attributed (the index admission). 2. Aged between 50 and 94 years The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included as the hospitalization to which the mortality outcome is attributed (the index admission). 2. Aged between 50 and 94 years The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included as the hospitalization to which the mortality outcome is attributed (the index admission). 2. Aged between 50 and 94 years The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included for the Medicare FFS population for the measure of a dimited dataset due to the EHR data elements included for the Medicare FFS population but was tested in a limited that wee spont the measure of a dimited the for th	To be included in the hospital level measure, cohort patients must be: 1. Enrolled in Medicare fee-for- service (FFS) Part A for the 12 months prior to the date of admission and during the index admission; 2. Aged 65 or over; 3. Discharged alive from a non-federal short-term acute care hospital; and 4. Not transferred to another acute care facility. The ACO version of this measure has the additional criterion that only hospitalizations for ACO-assigned beneficiaries that meet all of the other criteria listed above are included. The cohort definition is otherwise identical to that of the HWR described below. The measure aggregates the ICD-9 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the AHRQ CCS. There are a total of 235 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories) using the AHRQ CCS procedure atotal of 231 mutually exclusive procedure atotal of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories, the measure assigns each index hospifalization to one of ive mutually exclusive specialty cohores; synce mutually exclusive specialty cohores; synce mutually exclusive specialty cohores; synce mutually exclusive specialty cohores the mutualty exclusive specialty cohores the mutualty exclusive specialty cohores the mutualty exclusi	To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Enrolled in Medicare fee-for- service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission; 2. Aged 65 or older 3. Having a qualifying elective primary THA/TKA procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following: • Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission • Partial hip arthroplasty (PHA) procedures (with a concurrent THA/TKA); partial knee arthroplasty procedures are not distinguished by ICD9 codes and are currently captured by the THA/TKA measure • Revision procedures with a concurrent THA/TKA • Resurfacing procedures with a concurrent THA/TKA); partial knee arthroplasty procedures over anot distinguished by ICD9 codes and are currently captured by the THA/TKA • Resurfacing procedures with a concurrent THA/TKA • Mechanical complication coded in the principal discharge • Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm of the pelvis, sacrum, coced in the principal discharge diagnosis field of the index and malignant neoplasm of the pelvis, sacrum, coded in the principal discharge diagnosis field manteof in the principal discharge • Malignant neoplasm of the pelvis, sacrum, coded in the principal discharge diagnosis field manteof in the principal discharge • Transfer status form antother act the set in the principal discharge diagnosis	Medicare FFS beneficiaries admitted to non-federal acute care hospitals. Additional details are provided in S.7 Denominator Details. To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria: 1. Have a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or sepsis (not including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA; 2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission; 3. Aged 65 or over; and 4. Not transferred from another acute care facility ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.	To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria: 1. Have principal discharge diagnosis of COPD or principal discharge diagnosis of COPD with exacerbation; 2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission, beneficiaries; 3. Aged 65 or over; and 4. Not transferred from another acute care facility. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.	The measure included index admissions for patients: 1. Having a qualifying isolated CABG surgery during the index admission; 2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of the index admission, and enrolled in Part A during the index admission; and, 3. Aged 65 or over. Isolated CABG surgeries are defined as those CABG procedures performed without the following concomitant valve or other major cardiac, vascular, or thoracic procedures; o Valve procedures; o Atrial and/or ventricular septal defects; o Congenital anomalies; o Other open cardiac procedures; o Heart transplants; o Aorta or other non- cardiac arterial bypass procedures; o Head, neck, intracranial vascular procedures; or, o Other chest and thoracic procedures International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9) codes as well as International Classification of Diseases, 10th Revision (ICD-10) codes used to define the cohort are listed in the attached Data Dictionary.

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition,	All-Cause Unplanned	risk-standardized	all-cause, risk-	all-cause, risk-	Cause, Risk-Standardized
All-Procedure) Risk-	Readmission Measure	complication rate	standardized mortality	standardized mortality	Mortality Rate (RSMR)
Standardized	(HWR)	(RSCR) following	rate (RSMR) following	rate (RSMR) following	Following Coronary
Mortality Measure		elective primary total	pneumonia	chronic obstructive	Artery Bypass Graft
		hip arthroplasty (THA)	hospitalization	pulmonary disease	(CABG) Surgery
		and/or total knee		(COPD) hospitalization	
		arthroplasty (TKA)			
3. Not admitted for	organization is that	continuous			
primary psychiatric	conditions typically	enrollment in Part A			
diagnoses	cared for by the same	and Part B Medicare			
Rationale: Patients	team of clinicians are	fee-for-service (FFS)			
admitted for	expected to	12 months prior to the			
psychiatric treatment	experience similar	date of index			
are typically cared for	added (or reduced)	admission.			
in separate psychiatric	levels of readmission	This measure can also			
facilities that are not	risk.	be used for an all-			
comparable to short-	The measure first	payer population aged			
term acute care	assigns admissions	18 years and older.			
hospitals (see data	with qualifying AHRQ procedure categories	We have explicitly tested the measure in			
dictionary, HWM Non- Acute Care Inclusion	to the	both patients aged			
tab).	Surgery/Gynecology	18+ years and those			
4. Not admitted for	Cohort. This cohort	aged 65+ years (see			
rehabilitation	includes admissions	Section 2b4.11 of the			
Rationale: These	likely cared for by	Testing Attachment			
admissions are not	surgical or	for details, 2b4.11).			
typically to a short-	gynecological teams.	International			
term acute care	The measure then	Classification of			
hospital and are not	sorts admissions into	Diseases, 9th Revision,			
for acute care (see	one of the four	Clinical Modification			
data dictionary, HWM	remaining specialty	(ICD-9-CM) codes used			
Non-Acute Care	cohorts based on the	to define the cohort			
Inclusion tab).	AHRQ diagnosis	for each measure are:			
5. Not enrolled in	category of the principal discharge	ICD-9-CM codes used			
hospice at the time of,	diagnosis:	to define a THA or TKA:			
or 12 months prior to,	The Cardiorespiratory				
their index admission	Cohort includes	81.51 Total Hip Replacement			
Rationale: Patients	several condition	·			
enrolled in hospice in the prior 12 months or	categories with very	81.54 Total Knee Replacement			
at the time of	high readmission rates				
admission are unlikely	such as pneumonia,	ICD-10 Codes that define a THA or TKA:			
to have 30-day	chronic obstructive	OSR90J9 Replacement			
survival as a primary	pulmonary disease,	of Right Hip Joint with			
goal	and heart failure.	Synthetic Substitute,			
6. Not enrolled in	These admissions are	Cemented, Open			
hospice within two	combined into a single cohort because they	Approach			
days of admission	are often clinically	0SR90JA Replacement			
Rationale: There is not	indistinguishable and	of Right Hip Joint with			
a single, correct	patients are often	Synthetic Substitute,			
approach regarding	simultaneously	Uncemented, Open			
patients enrolled in	treated for several of	Approach			
hospice during	these diagnoses.	0SR90JZ Replacement			
admission or upon discharge – mortality	The Cardiovascular	of Right Hip Joint with			
may or may not	Cohort includes	Synthetic Substitute,			
represent a quality	condition categories	Open Approach			
signal for this group of	such as acute	OSRBOJ9 Replacement			
patients and hospice	myocardial infarction	of Left Hip Joint with			
enrollment is	that in large hospitals might be cared for by	Synthetic Substitute, Cemented, Open			
inadequate to	a separate cardiac or	Approach			
differentiate this	cardiovascular team.	OSRBOJA Replacement			
issue. However, for	The Neurology Cohort	of Left Hip Joint with			
most patients and/or	includes neurologic	Synthetic Substitute,			
families who had the	condition categories	Uncemented, Open			
discussion and agreed	such as stroke that in	Approach			

such as stroke that in Approach to enroll in hospice large hospitals might 0SRB0JZReplacement within two days of be cared for by a of Left Hip Joint with admission, 30-day separate neurology Synthetic Substitute, survival is not likely team. Open Approach the primary goal due The Medicine Cohort 0SRC07Z Replacement to their condition and includes all nonof Right Knee Joint not the quality of care surgical patients who with Autologous received. were not assigned to Tissue Substitute, 7. Not with a principal any of the other Open Approach diagnosis of cancer cohorts. OSRCOJZReplacement and enrolled in The full list of the of Right Knee Joint hospice during their specific diagnosis and with Synthetic index admission procedure AHRQ CCS Substitute, Open Rationale: Patients categories used to Approach admitted primarily for define the specialty OSRCOKZ Replacement cancer who are cohorts are attached enrolled in hospice of Right Knee Joint in data field S.2b (Data during admission are with Nonautologous Dictionary or Code Tissue Substitute, unlikely to have 30-Table). day survival as a Open Approach primary goal of care. 0SRD07Z Replacement (see data dictionary, of Left Knee Joint with

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition,	All-Cause Unplanned	risk-standardized	all-cause, risk-	all-cause, risk-	Cause, Risk-Standardized
All-Procedure) Risk-	Readmission Measure	complication rate	standardized mortality	standardized mortality	Mortality Rate (RSMR)
Standardized	(HWR)	(RSCR) following	rate (RSMR) following	rate (RSMR) following	Following Coronary
Mortality Measure		elective primary total	pneumonia	chronic obstructive	Artery Bypass Graft
		hip arthroplasty (THA)	hospitalization	pulmonary disease	(CABG) Surgery
		and/or total knee		(COPD) hospitalization	
		arthroplasty (TKA)			
HWM Cancer Inclusion		Autologous Tissue			
tab).		Substitute, Open			
8. Without any		Approach			
diagnosis of		OSRDOJZ Replacement			
metastatic cancer		of Left Knee Joint with			
Rationale: Although		Synthetic Substitute, Open Approach			
some patients					
admitted with a		OSRDOKZReplacement			
diagnosis of metastatic cancer will		of Left Knee Joint with Nonautologous Tissue			
have 30-day survival		Substitute, Open			
as a primary goal of		Approach			
care, for many such		0SRT07Z Replacement			
patients admitted to		of Right Knee Joint,			
the hospital, death		Femoral Surface with			
may be a clinically		Autologous Tissue			
reasonable and		Substitute, Open			
patient-centered		Approach			
outcome. (see data		OSRTOJZ Replacement			
dictionary, HWM		of Right Knee Joint,			
Metastatic Cancer		Femoral Surface with			
Inclusion tab).		Synthetic Substitute,			
9. Not with a principal discharge diagnosis or		Open Approach			
discharge diagnosis, or a secondary diagnosis		OSRTOKZ Replacement			
that is present on		of Right Knee Joint,			
admission (POA) for a		Femoral Surface with			
condition which		Nonautologous Tissue			
hospitals have limited		Substitute, Open Approach			
ability to influence		OSRU07Z Replacement			
survival		of Left Knee Joint,			
Rationale: Hospitals		Femoral Surface with			
have little ability to		Autologous Tissue			
impact mortality for		Substitute, Open			
some conditions. This		Approach			
list of conditions (see		OSRUOJZ Replacement			
data dictionary, HWM		of Left Knee Joint,			
ICD-10 Inclusion tab) was determined		Femoral Surface with			
through independent		Synthetic Substitute,			
review, by several		Open Approach			
clinicians, of		OSRUOKZ Replacement			
conditions associated		of Left Knee Joint,			
with high mortality.		Femoral Surface with			
The decisions were		Nonautologous Tissue			
also reviewed with our		Substitute, Open Approach			
Technical Expert Panel					
(TEP) and Technical		OSRVO7Z Replacement of Right Knee Joint,			
Work Group.		Tibial Surface with			
Admissions are not included in the cohort		Autologous Tissue			
if the patient had a		Substitute, Open			
principal diagnosis		Approach			
code that is on this		OSRVOJZ Replacement			
list, or a secondary		of Right Knee Joint,			
code with POA that is		Tibial Surface with			
on the list.		Synthetic Substitute,			
In addition, for		Open Approach			
patients with multiple		OSRVOKZ Replacement			
admissions, the		of Right Knee Joint,			
measure selects only		Tibial Surface with			
one admission, at		Nonautologous Tissue			
random, for inclusion. There is no practical		Substitute, Open Approach			
statistical modeling		OSRW07Z			
approach that can		Replacement of Left			
account or adjust for		Knee Joint, Tibial			
the complex		Surface with			
relationship between		Autologous Tissue			
the number of		Substitute, Open			
admissions and risk of		Approach			
mortality in the		0SRW0JZ Replacement			
context of a hospital-		of Left Knee Joint,			
wide mortality measure. Random		Tibial Surface with			
selection ensures that		Synthetic Substitute,			
providers are not		Open Approach			
penalized for a "last"		OSRWOKZ			
admission during the		Replacement of Left			
measurement period;		Knee Joint, Tibial Surface with			
selecting the last		Nonautologous Tissue			
admission would not					

	1700-11			100211	
3502 Hybrid Hospital- Wide (All-Condition,	1789 Hospital-Wide All-Cause Unplanned	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-cause, risk-	1893 Hospital 30-Day, all-cause, risk-	2558 Hospital 30-Day, All- Cause, Risk-Standardized
All-Procedure) Risk-	Readmission Measure	complication rate	standardized mortality	standardized mortality	Mortality Rate (RSMR)
Standardized Mortality Measure	(HWR)	(RSCR) following elective primary total	rate (RSMR) following pneumonia	rate (RSMR) following chronic obstructive	Following Coronary Artery Bypass Graft
		hip arthroplasty (THA)	hospitalization	pulmonary disease	(CABG) Surgery
		and/or total knee		(COPD) hospitalization	
be as accurate a		arthroplasty (TKA) Substitute, Open			
reflection of the risk of		Approach			
death as random selection, as the last		An ICD-9 to ICD-10			
admission is		crosswalk is attached in field S.2b. (Data			
inherently associated		Dictionary or Code			
with a higher mortality risk. Random		Table).			
selection is also used		Elective primary THA/TKA procedures			
in CMS's condition- specific mortality		are defined as those			
measures. Note that		procedures without any of the following:			
random selection		1) Femur, hip, or			
reduces the number of admissions, but		pelvic fractures coded			
does not exclude any		in principal or secondary discharge			
patients from the measure.		diagnosis fields of the			
The cohort is defined		index admission			
using ICD-10 Clinical		2) Partial hip arthroplasty (PHA)			
Modification codes identified in Medicare		procedures with a			
Part A Inpatient claims		concurrent THA/TKA			
data. The measure aggregates the ICD-10		3) Revision procedures with a concurrent			
principal diagnosis and		ΤΗΑ/ΤΚΑ			
all procedure codes of		4) Resurfacing procedures with a			
the index admission into clinically coherent		concurrent THA/TKA			
groups of conditions		5) Mechanical			
and procedures		complication coded in the principal discharge			
(condition categories or procedure		6) Malignant			
categories) using the		neoplasm of the			
Agency for Healthcare Research and Quality		pelvis, sacrum, coccyx, lower limbs, or			
(AHRQ) Clinical		bone/bone marrow or			
Classifications System (CCS). There is a total		a disseminated			
of 285 mutually		malignant neoplasm coded in the principal			
exclusive AHRQ		discharge diagnosis			
condition categories, most of which are		field 7) Removal of			
single, homogenous		implanted			
diseases such as pneumonia or acute		devises/prostheses			
myocardial infarction.		8) Transfer status from another acute			
Some are aggregates		care facility for the			
of conditions, such as "other bacterial		ΤΗΑ/ΤΚΑ			
infections". There is a		For a full list of ICD-9 and ICD-10 codes			
total of 231 mutually exclusive procedure		defining the following			
categories. Using the		see attached Data			
AHRQ CCS procedure and condition		Dictionary, sheet "THA TKA Cohort Codes Part			
categories, the		2."			
measure assigns each					
index hospitalization to one of 15 mutually					
exclusive divisions.					
The divisions were created based upon					
clinical coherence,					
consistency of					
mortality risk, adequate patient and					
hospital case volume					
for stable results reporting, and input					
from clinicians,					
patients, and patient					
caregivers on usability.					
The measure first					
assigns admissions					
with qualifying AHRQ procedure categories					
to one of six surgery					
divisions by identifying					
a defining surgical procedure. The					
defining surgical					

			1		1	
	3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
	Wide (All-Condition, All-Procedure) Risk-	All-Cause Unplanned Readmission Measure	risk-standardized	all-cause, risk- standardized mortality	all-cause, risk-	Cause, Risk-Standardized
	Standardized	(HWR)	complication rate (RSCR) following	rate (RSMR) following	standardized mortality rate (RSMR) following	Mortality Rate (RSMR) Following Coronary
	Mortality Measure		elective primary total	pneumonia	chronic obstructive	Artery Bypass Graft
			hip arthroplasty (THA)	hospitalization	pulmonary disease	(CABG) Surgery
			and/or total knee		(COPD) hospitalization	
	procedure is identified		arthroplasty (TKA)			
	using the following					
	algorithm: 1) if a					
	patient only has one					
	major surgical procedure then that					
	procedure is the					
	defining surgical					
	procedure; 2) if a					
	patient has more than one major surgical					
	procedure, the first					
	dated procedure					
	performed during the index admission is the					
	defining surgical					
	procedure; 3) if there					
	is more than one					
	major surgical					
	procedure on that earliest date, the					
	procedure with the					
	highest mortality rate					
	is the defining surgical					
	procedure. These divisions include					
	admissions likely					
	cared for by surgical					
	teams.					
	The surgical divisions are: Surgical Cancer					
	(see note below),					
	Cardiothoracic					
	Surgery, General					
	Surgery, Neurosurgery,					
	Orthopedic Surgery,					
	and Other Surgical					
	Procedures.					
	For the Surgical					
	Cancer division, any admission that					
	includes a surgical					
	procedure and a					
	principal discharge					
	diagnosis code of cancer is assigned to					
	the Surgical Cancer					
	division. This division					
	and the logic behind it					
	was implemented in response to feedback					
	from our Technical					
	Expert Panel.					
	The measure then					
	assigns the remaining admissions into one of					
	the nine non-surgical					
	divisions based on the					
	AHRQ diagnostic CCS					
	of the principal					
	discharge diagnosis. The non-surgical					
	divisions are: Cancer,					
	Cardiac,					
	Gastrointestinal, Infectious Disease,					
	Neurology,					
	Orthopedic,					
	Pulmonary, Renal,					
	Other Conditions.					
	The full list of the specific diagnosis and					
	procedure AHRQ CCS					
	categories used to					
	define the divisions					
	are attached in the Data Dictionary.					
Exclusions	The measure excludes	The measure excludes	This measure excludes	This mortality measure	The mortality measure	The CABG surgery
Enclusions	index admissions for	index admissions for	index admissions for	excludes index	excludes index	mortality measure
	patients:	patients:	patients:	admissions for patients:	admissions for patients:	excludes index
						admissions for patients:

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	<ol> <li>With inconsistent or unknown vital status (from claims data) or other unreliable claims data;</li> <li>Discharged against medical advice (AMA);</li> <li>With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and</li> <li>With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.</li> </ol>	<ol> <li>Admitted to Prospective Payment System (PPS)-exempt cancer hospitals;</li> <li>Without at least 30 days post-discharge enrollment in FFS Medicare;</li> <li>Discharged against medical advice (AMA);</li> <li>Admitted for primary psychiatric diagnoses;</li> <li>Admitted for rehabilitation; or</li> <li>Admitted for medical treatment of cancer.</li> </ol>	<ol> <li>Without at least 90 days post-discharge enrollment in FFS Medicare;</li> <li>Who were discharged against medical advice (AMA); or,</li> <li>Who had more than two THA/TKA procedure codes during the index hospitalization.</li> <li>After applying these exclusion criteria, we randomly select one index admission for patients with multiple index admissions in a calendar year. We therefore exclude the other eligible index admissions in that year.</li> </ol>	<ol> <li>Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;</li> <li>With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;</li> <li>Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or,</li> <li>Discharged against medical advice.</li> <li>For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.</li> <li>Similarly, for the three- year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admissions are excluded to avoid assigning a single death to two admissions.</li> </ol>	<ol> <li>With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;</li> <li>Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or</li> <li>Discharged against medical advice For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.</li> <li>Similarly, for the three- year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.</li> </ol>	<ol> <li>With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; or,</li> <li>Discharged against medical advice (AMA).</li> <li>For patients with more than one qualifying CABG surgery admission in the measurement period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.</li> </ol>
Exclusion Details	<ol> <li>With inconsistent or unknown vital status (from claims data) or other unreliable claims data.</li> <li>Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before</li> </ol>	<ol> <li>Admitted to a PPS- exempt cancer hospital, identified by the Medicare provider ID.</li> <li>Admissions without at least 30 days post- discharge enrollment in FFS Medicare are determined using data captured in the Medicare Enrollment Database (EDB).</li> </ol>	This measure excludes index admissions for patients: 1. Without at least 90 days post-discharge enrollment in FFS Medicare Rationale: The 90-day complication outcome cannot be assessed in this group since claims data are used to determine whether a	<ol> <li>Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years;</li> <li>if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male' or 'female'.</li> </ol>	1. Inconsistent vital status or unreliable demographic data in the claims Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment	The CABG surgery mortality measure excludes index admissions for patients: 1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data. Rationale: We do not include stays for patients where the age (indicated in the claim) is greater

the date of discharge but the patient was discharged alive because these are likely errors in the data. 2. Discharged against medical advice (AMA) Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS

3. Discharges against medical advice (AMA) occurred. are identified using 2. Who were the discharge disposition indicator in claims data. or, 4. Admitted for primary psychiatric disease, identified by a principal diagnosis in one of the specific AHRQ CCS categories discharge. listed in the attached data dictionary. 5. Admitted for rehabilitation care, identified by the specific ICD-9 diagnosis codes included in CCS 254 (Rehabilitation care; fitting of prostheses;

complication of care discharged against medical advice (AMA); Rationale: Providers did not have the opportunity to deliver full care and prepare indicator. the patient for 3. Who had more than two THA/TKA procedure codes during the index hospitalization Rationale: Although clinically possible, it is highly unlikely that patients would receive

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice enrollment data. 3. Discharges against medical advice (AMA) are identified using the discharge disposition After exclusions #1-3 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the

Database, or where the date of death occurs before the date of discharge but the patient was discharged alive. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database. Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse

than 115, where the gender (indicated in the claim) is neither male nor female, where the admission date (indicated in the claim) is after the date of death in the Medicare Enrollment Database, or where the date of death (in the Medicare Enrollment Database) occurs before the date of discharge but the patient was discharged alive (indicated in the claim). 2. Discharged against medical advice (AMA). Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for

3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240). Rationale: Even though a hospital ikely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals. 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year. Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are heeded. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions nto larger categories. These admissions nto larger categories. These admissions nto larger categories. These admissions of a curate risk prediction and coherent risk grouping and are therefore excluded. Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non- convergence of those division-level risk models. The total	and adjustment of devices). 6. Admitted for medical treatment of cancer, identified by the specific AHRQ CCS categories listed in the attached data dictionary.	more than two elective THA/TKA procedures in one hospitalization, which may reflect a coding error.	outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions. Individual codes with descriptors can be found in the attached Data Dictionary.	outcome or signal of poor quality care. 2. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in the claim. Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. Individual codes with descriptors can be found in the attached Data Dictionary.	discharge. This information is taken from the discharge disposition in the claim. 3. With more than one qualifying CABG surgery admission in the measurement period. Rationale: CABG procedures are expected to last for several years without the need for revision or repeat revascularization. A repeat CABG procedure during the measurement period likely represents a complication of the original CABG procedure and is a clinically more complex and higher risk surgery. Therefore, we select the first CABG surgery admission for inclusion in the measure and exclude subsequent CABG surgery admissions (additional claims indicating a CABG procedure was performed within 30-days of the index CABG procedure) from the cohort.

models. The total			
number of patients			
excluded is very small			
(13,597 or 0.21% of			
admissions for a cut			
off of 100). During			
measure development			
we also explored the			
option of pooling low-			
volume CCS codes			
(CCS<100 patients)			
into one group,			
however, the			
heterogeneity in			
mortality rates for the			
individual ICD-10			
codes in those groups			
would preclude			
adequate risk			
adjustment. The TEP			
supported excluding			
these admissions.			

	3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Risk Adjustment	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model
Stratification	N/A	N/A	N/A	N/A	N/A	N/A
Type Score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score
Algorithm	The measure estimates hospital- level, risk- standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain	This measure estimates a hospital- level 30-day all-cause RSRR using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient, and hospital levels to account for variance in patient outcomes within and between hospitals (Normand et al., 2007). At the patient level, it models the log-odds of readmission within 30 days of discharge using age, selected clinical covariates, and a hospital -specific effect. At the hospital level, the approach models the hospital specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of a readmission, after accounting for patient risk. The hospital- specific effects are given a distribution to account for the clustering (non- independence) of patients within the same hospital (Normand et al., 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals. Admissions are	The measure estimates hospital- level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of a complication occurring within 90 days of the index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital- specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a complication at the hospital, after accounting for patient risk. The hospital- specific intercepts are given a distribution to account for the clustering (non- independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical	The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for pneumonia using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital- specific intercepts are given a distribution to account for the clustering (non- independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals. The RSMR is calculated	The measure estimates hospital-level 30-day all- cause RSMRs following hospitalization for COPD using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log- odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital, after accounting for patient swithin the same hospital. If there were no differences among hospital, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals. The RSMR is calculated as the ratio of the number of "predicted" to the number of	The measure estimates hospital-level 30-day all- cause RSMRs for CABG surgery using a hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log- odds of mortality within 30 days of the procedure date using age, sex, selected clinical covariates, and a hospital-specific effect. At the hospital level, the approach models the hospital-specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital, after account for the clustering (non- independence) of patients within the same hospital (Normand and Shahian, 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals. The RSMR is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed

Monte Carlo (MCMC) technique. Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of

assigned to one of five mutually exclusive specialty cohort groups consisting of related conditions or procedures. For each specialty cohort group, the standardized readmission ratio (SRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted

across all hospitals. The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given hospital, multiplied by the national observed complication rate. For each hospital, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator

as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach

by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's

mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix, to be compared to an average hospital's

3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk-	1789 Hospital-Wide All-Cause Unplanned Readmission Measure	1550 Hospital-level risk-standardized complication rate	0468 Hospital 30-day, all-cause, risk- standardized mortality	1893 Hospital 30-Day, all-cause, risk- standardized mortality	2558 Hospital 30-Day, A Cause, Risk-Standardize Mortality Rate (RSMR)
Standardized Mortality Measure	(HWR)	(RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	rate (RSMR) following pneumonia hospitalization	rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Following Coronary Artery Bypass Graft (CABG) Surgery
deaths is based on the	based on the	is the number of	is analogous to a ratio	performance given its	performance with the
hospital's	hospital's	complications	of "observed" to	case mix to an average	same case mix. Thus, a
performance with its	performance with its	expected based on the	"expected" used in	hospital's performance	lower ratio indicates
observed case mix and	observed case mix and	nation's performance	other types of	with the same case mix.	lower-than-expected
service mix, and is	service mix, and the	with that hospital's	statistical analyses. It	Thus, a lower ratio	mortality rates or bette
calculated by using	denominator is the	case mix. This	conceptually allows for	indicates lower-than-	quality, while a higher
the coefficients estimated by	number of readmissions	approach is analogous to a ratio of	a comparison of a particular hospital's	expected mortality rates	ratio indicates higher- than-expected mortalit
regressing the risk	expected based on the	"observed" to	performance given its	or better quality, and a higher ratio indicates	rates or worse quality.
factors and the	nation's performance	"expected" used in	case mix to an average	higher-than-expected	
hospital-specific effect	with that hospital's	other types of	hospital's performance	mortality rates or worse	The "predicted" numb of deaths (the numera
on the risk of	case mix and service	statistical analyses. It	with the same case mix.	quality.	is calculated by using t
mortality. The	mix. This approach is	conceptually allows	Thus, a lower ratio	The "predicted" number	coefficients estimated
estimated hospital-	analogous to a ratio of	for a comparison of a	indicates lower-than-	of deaths (the	regressing the risk fact
specific effect for each	"observed" to	particular hospital's	expected mortality	numerator) is calculated	and the hospital-specif
cohort is added to the	"expected" used in	performance given its	rates or better quality,	by using the coefficients	effect on the risk of
sum of the estimated	other types of	case mix to an average	and a higher ratio	estimated by regressing	mortality. The estimate
regression coefficients	statistical analyses. It	hospital's	indicates higher-than-	the risk factors and the	hospital-specific effect
multiplied by patient	conceptually allows a	performance with the	expected mortality	hospital-specific	added to the sum of th
characteristics. The results are	particular hospital's performance, given its	same case mix. Thus, a	rates or worse quality.	intercept on the risk of	estimated regression
transformed via an	case mix and service	lower ratio indicates lower-than-expected	The "predicted"	mortality. The estimated	coefficients multiplied
inverse logit function	mix, to be compared	complication rates or	number of deaths (the	hospital-specific effect is added to the sum of the	the patient
and summed over all	to an average	better quality, and a	numerator) is calculated by using the	estimated regression	characteristics. The results are log
patients attributed to	hospital's	higher ratio indicates	coefficients estimated	coefficients multiplied by	transformed and sumr
a hospital to get a	performance with the	higher-than-expected	by regressing the risk	the patient	over all patients
predicted value. The	same case mix and	complication rates or	factors and the	characteristics. The	attributed to a hospita
expected number of	service mix. Thus, a	worse quality.	hospital-specific	results are log	get a predicted value.
deaths is based on the	lower ratio indicates	The "predicted"	intercept on the risk of	transformed and	"expected" number of
nation's performance	lower-than-expected	number of admissions	mortality. The	summed over all patients	deaths (the denominat
with that hospital's	readmission rates or	with a complication	estimated hospital-	attributed to a hospital	is obtained in the same
case mix and service mix and is obtained in	better quality, while a higher ratio indicates	(the numerator) is	specific effect is added	to get a predicted value.	manner, but a commo
the same manner, but	higher-than-expected	calculated by using the coefficients	to the sum of the	The "expected" number	effect using all hospita
a common effect using	readmission rates or	estimated by	estimated regression coefficients multiplied	of deaths (the denominator) is obtained	in our sample is added place of the hospital-
all hospitals in our	worse quality.	regressing the risk	by the patient	in the same manner, but	specific effect. The res
sample is added in	For each specialty	factors and the	characteristics. The	a common intercept	are log transformed ar
place of the hospital-	cohort, the	hospital-specific	results are log	using all hospitals in our	summed over all patie
specific effect. The	"predicted" number of	intercept on the risk	transformed and	sample is added in place	in the hospital to get a
results are	readmissions (the	of having an	summed over all	of the hospital-specific	expected value. To ass
transformed via an	numerator) is	admission with a	patients attributed to a	intercept. The results are	hospital performance
inverse logit function	calculated by using	complication. The	hospital to get a	log transformed and	each reporting period,
and summed over all patients in the	the coefficients	estimated hospital-	predicted value. The	summed over all patients	re-estimate the model
hospital to get an	estimated by regressing the risk	specific intercept is added to the sum of	"expected" number of	in the hospital to get an	coefficients using the years of data in that
expected value. This	factors (found in Table	the estimated	deaths (the denominator) is	expected value. To assess hospital performance for	period.
approach is analogous	D.9) and the hospital-	regression coefficients	obtained in the same	each reporting period,	This calculation
to a ratio of	specific effect on the	multiplied by the	manner, but a common	we re-estimate the	transforms the ratio of
"observed" to	risk of readmission.	patient characteristics.	intercept using all	model coefficients using	predicted over expected
"expected" used in	The estimated	The results are log	hospitals in our sample	the years of data in that	into a rate that is
other types of	hospital-specific effect	transformed and	is added in place of the	period.	compared to the natio
statistical analyses. It	for each cohort is	summed over all	hospital-specific	This calculation	observed mortality rat
conceptually allows a	added to the sum of	patients attributed to	intercept. The results	transforms the ratio of	The hierarchical logisti
particular hospital's	the estimated	a hospital to get a	are log transformed	predicted over expected	regression models are
performance, given its case mix and service	regression coefficients	predicted value. The	and summed over all	into a rate that is	described fully in the
mix, to be compared	multiplied by patient	"expected" number of	patients in the hospital	compared to the national	original methodology
to an average	characteristics. The results are log	admissions with a complication (the	to get an expected value. To assess	observed readmission	report (Suter et al. 201
hospital's	transformed and	denominator) is	hospital performance	rate. The hierarchical	Reference:
performance with the	summed over all	obtained in the same	for each reporting	logistic regression models are described	1. Normand S-LT, Shah
same case mix and	patients attributed to	manner, but a	period, we re-estimate	fully in the original	DM. 2007. Statistical ar

same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality. To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period. The division-level SMRs are then pooled for each hospital using an inverse varianceweighted geometric mean to create a

patients attributed to a hospital to get a predicted value. The "expected" number of readmissions (the denominator) is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospitalspecific effect. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model

manner, but a common intercept using all hospitals in our sample is added in place of the hospitalspecific effect. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate

period, we re-estimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References: 1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical

Aspects of Hospital

fully in the original methodology report (Krumholz et al., 2005). References: 1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226. 2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology. DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226. 2. Suter L, Wang C, Araas M, et al. Hospital-Level 30-day All-Cause Mortality Following Coronary Artery Bypass Graft Surgery; Updated Measure Methodology

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3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.	coefficients using the data in that period. The specialty cohort SRRs are then pooled for each hospital using a volume-weighted geometric mean to create a hospital-wide composite SRR. The composite SRR. The composite SRR is multiplied by the national observed readmission rate to produce the RSR. The statistical modeling approach is described fully in Appendix A and in the original methodology report (Horwitz et al., 2012). The ACR quality measure was adapted from the HWR quality measure. The unit of analysis was changed from the hospital to the ACO. This was possible because both the HWR and ACR measures assess readmission performance for a population that clusters patients together (either in hospitals or in ACOs). The goal is to isolate the effects of beneficiary characteristics on the probability that a patient will be readmitted from the effects of being in a specific hospital or ACO. In addition, planned readmissions are excluded for the ACR quality measure in the same way that they are excluded for the HWR measure. The ACR measure is calculated identically to what is described above for the HWR measure. References: Horwiz L, Partovian C, Lin Z, et al. Hospital- Winglanned Readmission Measure: The ACR measure is calculated identically to what is described above for the HWR measure. References: Horwiz L, Partovian C, Lin Z, et al. Hospital- Winglename%3DDryR un_HWR_TechReport _081012.pdf&blobcol =uridata&blobtable= MungoBlobs.	that is compared to the national observed complication rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2012). References: Grosso L, Curtis J, Geary L, et al. Hospital-level Risk- Standardized Complication Rate Following Elective Primary Total Hip Arthroplasty (THA) And/Or Total Knee Arthroplasty (TKA) Measure Methodology Report. 2012. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206- 226.	Outcomes Profiling. Stat Sci 22(2): 206-226. 2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk- Adjustment Models for AMI and HF 30-Day Mortality Methodology.		

	3502 Hybrid Hospital-	1789 Hospital-Wide	1550 Hospital-level	0468 Hospital 30-day,	1893 Hospital 30-Day,	2558 Hospital 30-Day, All-
	Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA)	all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease	Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
			and/or total knee arthroplasty (TKA)		(COPD) hospitalization	
Submission	E 1 Identified	Accessed 30 April, 2014. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206- 226.		E 1 Identified	E 1 Identified measures	E 1 Identified measures
Submission items	5.1 Identified measures: 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: This hybrid HWM measure incorporates patient- level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital- wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital- Wide All-Cause Risk- Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement	5.1 Identified measures: 1768 : Plan All-Cause Readmissions (PCR) 1891 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization 1551 : Hospital-level 30-day risk- standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) 0695 : Hospital 30-Day Risk-Standardized Readmission Rates following Percutaneous Coronary Intervention (PCI) 0329 : Risk-Adjusted 30-Day All-Cause Readmission Rate 0330 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following heart failure (HF) hospitalization 0505 : Hospital 30-day all-cause risk- standardized readmission rate (RSRR) following heart failure (HF) hospitalization	5.1 Identified measures: 0534 : Hospital specific risk- adjusted measure of mortality or one or more major complications within 30 days of a lower extremity bypass (LEB). 0564 : Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures 1551 : Hospital-level 30-day risk- standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) 2052 : Reduction of Complications through the use of Cystoscopy during Surgery for Stress Urinary Incontinence 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome measures (for example, process measures) with the same target population as our measure. Because this	5.1 Identified measures: 0708 : Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window) 0231 : Pneumonia Mortality Rate (IQI #20) 0506 : Hospital 30-day, all-cause, risk- standardized readmission rate (RSRR) following pneumonia hospitalization 0279 : Community Acquired Pneumonia Admission Rate (PQI 11) 2579 : Hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia (PN) 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: The pneumonia mortality measure cohort, version 9.0, is harmonized with the hospital-level, risk- standardized payment associated with a 30- day episode of care for pneumonia cohort. Version 9.2 of the pneumonia mortality measure cohort is, however, not harmonized with the pneumonia payment	5.1 Identified measures: 0701 : Functional Capacity in COPD patients before and after Pulmonary Rehabilitation 0700 : Health-related Quality of Life in COPD patients before and after Pulmonary Rehabilitation 0275 : Chronic 0bstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate (PQI 05) 1891 : Hospital 30-day, all-cause, risk- standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (for example, process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. Additionally, the measure, with the specified cohort, has been publicly reported	5.1 Identified measures: 0114 : Risk-Adjusted Postoperative Renal Failure 0115 : Risk-Adjusted Surgical Re-exploration 0119 : Risk-Adjusted Operative Mortality for CABG 0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery 0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery 0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation) 0130 : Risk-Adjusted Deep Sternal Wound Infection 0131 : Risk-Adjusted Deep Sternal Wound Infection 0131 : Risk-Adjusted Stroke/Cerebrovascular Accident 0229 : Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization 0230 : Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older 0468 : Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older 0468 : Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization 0535 : 30-day all-cause
	other more narrowly defined mortality measures and allow a	standardized readmission rate (RSRR) following	is an outcome measure, clinical coherence of the	measure cohort. There is intention to harmonize the	since December 2014. Because this is an outcome measure,	risk-standardized mortality rate following percutaneous coronary

measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized

pneumonia hospitalization 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: This measure and the National Committee for Quality Assurance (NCQA) Plan All-Cause Readmissions (PCR) Measure #1768 are related measures, but are not competing because they don't have the same measure focus and same target population. In

cohort takes precedence over alignment with related non-outcome measures. Furthermore, nonoutcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). 5b.1 If competing, why superior or

pneumonia mortality and payment measure cohorts in the future. We did not include in our list of related measures any nonoutcome (for example, process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, nonoutcome measures are limited due to broader patient exclusions. This

clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). 5b.1 If competing, why superior or rationale for additive value: N/A

percutaneous coronary intervention (PCI) for patients without ST segment elevation myocardial infarction (STEMI) and without cardiogenic shock 0536 : 30-day all-cause risk-standardized mortality rate following Percutaneous Coronary Intervention (PCI) for patients with ST segment elevation myocardial infarction (STEMI) or cardiogenic shock 1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery 1893 : Hospital 30-Day, all-cause, risk-

2502 Hybrid Hespital	1790 Hospital Wide	1550 Hospital Joyal	0169 Hospital 20 day	1902 Hospital 20 Day	2559 Hospital 20 Day All
3502 Hybrid Hospital- Wide (All-Condition,	1789 Hospital-Wide All-Cause Unplanned	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-cause, risk-	1893 Hospital 30-Day, all-cause, risk-	2558 Hospital 30-Day, All- Cause, Risk-Standardized
All-Procedure) Risk-	Readmission Measure	complication rate	standardized mortality	standardized mortality	Mortality Rate (RSMR)
Standardized	(HWR)	(RSCR) following	rate (RSMR) following	rate (RSMR) following	Following Coronary
Mortality Measure		elective primary total	pneumonia	chronic obstructive	Artery Bypass Graft
		hip arthroplasty (THA)	hospitalization	pulmonary disease	(CABG) Surgery
		and/or total knee		(COPD) hospitalization	
		arthroplasty (TKA)			
Readmission Measure	addition, both have	rationale for	is because they		standardized mortality
(NQF #1789) in a	been previously	additive value: N/A	typically only include a		rate (RSMR) following
couple of ways. First, this HWM measure	harmonized to the extent possible under		specific subset of patients who are		chronic obstructive pulmonary disease
includes patients with	the guidance of the		eligible for that		(COPD) hospitalization
a principal discharge	National Quality		measure (for example,		2515 : Hospital 30-day,
diagnosis of cancer,	Forum Steering		patients who receive a		all-cause, unplanned, risk-
whereas those	Committee in 2011.		specific medication or		standardized readmission
patients are not	Each of these		undergo a specific		rate (RSRR) following
included in the	measures has		procedure). Lastly, this		coronary artery bypass
readmission measure.	different		measure and the NQF Inpatient Pneumonia		graft (CABG) surgery
Cancer patients are appropriate to include	specifications. NCQA's Measure #1768		Mortality (AHRQ)		5a.1 Are specs completely
as many have survival	counts the number of		Measure #0231 are		harmonized? Yes
as their primary goal,	inpatient stays for		complementary rather		5a.2 If not completely
however due to	patients aged 18 and		than competing		harmonized, identify
cancer treatment	older during a		measures. Although		difference, rationale, impact: We did not
plans, readmissions	measurement year		they both assess		include in our list of
are frequently part of the plan and expected	that were followed by an acute readmission		mortality for patients admitted to acute care		related measures any
and therefore are not	for any diagnosis to		hospitals with a		non-outcome (e.g.,
a reasonable signal of	any hospital within 30		principal discharge		process) measures with
quality. Another	days. It contrasts this		diagnosis of		the same target
difference between	count with a		pneumonia, the		population as our
the two measures is	calculation of the		specified outcomes are		measure. Our measure cohort was heavily vetted
the number of	predicted probability of an acute		different. This measure		by clinical experts, a
divisions or specialty cohorts the patients	readmission. NCQA's		assesses 30-day mortality while #0231		technical expert panel,
are divided into in	measure is intended		assesses inpatient		and a public comment
order to more	for quality monitoring		mortality. Assessment		period. In addition, the
accurately risk adjust	and accountability at		of 30-day and inpatient		related claims-based
for case-mix and	the health plan level.		mortality outcomes		CABG readmission
service-mix. The	This measure		have distinct		measure, which utilizes the same definition of
readmission measure divides patients into	estimates the risk- standardized rate of		advantages and uses which make them		isolated CABG as the
six categories, or	unplanned, all-cause		complementary as		mortality measure, was
"specialty cohorts",	readmissions to a		opposed to competing.		validated using STS clinical
while the mortality	hospital or ACO for		For example the 30-day		registry data. Because this
measure uses 15. This	any eligible condition		period provides a		is an outcome measure,
is because the risk of	within 30 days of		broader perspective on		clinical coherence of the
mortality is much	hospital discharge for		hospital care and utilizes standard time		cohort takes precedence over alignment with
more closely related to patient factors than	patients aged 18 and older. The measure		period to examine		related non-outcome
readmission is related	will result in a single		hospital performance		measures. Furthermore,
to patient factors. PSI-	summary risk-adjusted		to avoid bias by		non-outcome measures
02 (NQF #0357) is	readmission rate for		differences in length of		are limited due to broader
another	conditions or		stay among hospitals.		patient exclusions. This is
complementary	procedures that fall		However, in some		because they typically only include a specific
mortality measure, which captures a	under five specialties: surgery/gynecology,		settings it may not be feasible to capture		subset of patients who
different patient	general medicine,		post-discharge		are eligible for that
population and a	cardiorespiratory,		mortality making the		measure (for example,
different outcome	cardiovascular, and		inpatient measure		patients who receive a
compared with the	neurology. This		more useable. We have		specific medication or
HWM measure	measure is specified		previously consulted		undergo a specific
submitted with this	for evaluating hospital		with AHRQ to examine		procedure).
application. PSI-02 captures patients 18	or ACO performance. However, despite		harmonization of complementary		5b.1 If competing, why
years of age or older,	these differences in		measures of mortality		superior or rationale for
or obstetric patients,	cohort specifications,		for patients with AMI		additive value: The NQF-
whereas the HWM	both measures under		and stroke. We have		endorsed STS measure

measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the

whereas the HWM both measures under NQF guidance have been harmonized to the extent possible through modifications such as exclusion of planned readmissions. We did not include in our list of related measures any nonoutcome (e.g., process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures.

and stroke. We have found that the measures are harmonized to the extent possible given that small differences in cohort inclusion and exclusion criteria are warranted on the basis of the use of different outcomes. However, this current measure has been modified from the last endorsed version to include patients with a principal discharge diagnosis of sepsis and a secondary discharge diagnosis of pneumonia that is present on admission. The cohort was also expanded to

that has the same target population and similar measure focus as the proposed CABG mortality measure is the Riskadjusted operative mortality for CABG (NQF #0119). The measure steward for the registrybased mortality measure for CABG is STS. In developing the measure, we sought to harmonize with the STS measure to the greatest extent feasible given competing measure design objectives and differences in the data source. The potential sources of discrepancy are target patient population, age, isolated CABG,

3502 Hybrid Hospital- Wide (All-Condition, All-Procedure) Risk- Standardized Mortality Measure	1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30-Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures. 5b.1 If competing, why superior or rationale for additive value: There are no competing NQF- endorsed measures.	Furthermore, non- outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). 5b.1 If competing, why superior or rationale for additive value: N/A		include patients with a principal discharge diagnosis of aspiration pneumonia. Thus the current measure cohort is no longer harmonized with measure #0231. 5b.1 If competing, why superior or rationale for additive value: N/A		period of observation, and included hospitals. The STS measure also assesses both deaths occurring during CABG hospitalization (in- hospital death, even if after 30 days) and deaths occurring within 30 days of procedure date. As indicated above, the proposed measure uses a standard follow-up period of 30 days of procedure date in order to measure each patient consistently. The proposed claims- based measure has been tested and is appropriate for use in all-payer data for patients 18 years and over. Finally, the STS cardiac surgery registry currently enrolls most, but not all, patients receiving CABG surgeries in the U.S. The proposed CABG mortality measure will capture all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry.

# Comparison of NQF 3502, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530 continued...

	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
Steward	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services	Centers for Medicare & Medicaid Services (CMS)	Agency for Healthcare Research and Quality	Agency for Healthcare Research and Quality
Description	The measure estimates a hospital-level 30- day risk- standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital- wide readmissions measure (NQF 1789 and NQF 2879e).Because of the homology between the claims and hybrid HWM measures, there is no resport to analyses done for the claims-only measure would differ in any significant way from results of analyses for a nalyses for	This measure estimates a hospital- level, 30-day risk- standardized mortality rate (RSMR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI). Mortality is defined as death from any cause within 30 days after the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years and older and are Medicare fee-for-service (FFS) beneficiaries hospitalized in non- federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.	The measure estimates a hospital-level 30- day risk- standardized mortality rate (RSMR). Mortality is defined as death for any cause within 30 days after the admission date for the index admission, for patients 18 and older discharged from the hospital with a principal diagnosis of heart failure (HF). The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for- service (FFS) beneficiaries and hospitalized in non- federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.	This stroke mortality measure estimates the hospital-level, risk- standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all- cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in- hospital death, for stroke patients. This is a newly developed measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity in the risk-adjustment model. This measure uses Medicare fee-for- service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.	In-hospital deaths per 1,000 discharges for low mortality (< 0.5%) Diagnosis Related Groups (DRGs) among patients ages 18 years and older or obstetric patients. Excludes cases with cancer, cases with cancer, cases with cancer, cases with an immunocompromis ed state, and transfers to an acute care facility. [NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]	A composite measure of in- hospital mortality indicators for selected conditions

Conditic Procedu Standard	-Wide (All- all-cause, risk- m, All- standardized re) Risk- mortality rate (RS	day, all-cause, risk standardized MR) mortality rate (RSMR) following tion heart failure (HF)	<ul> <li>2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity</li> </ul>	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
availabil as actua differen measure adjustm Differen measure testing t limitatio availabil 1. used for develop some te below fo differen measure a. claims-o measure nation-V Medicar claims a enrollme databas b. measure electron record ( databas hospital Kaiser P network includes claims d informa 2. patients 94. b. measure all patie 94 (see I discussio justificar 3. empiric testing a. possible hybrid n due to li availabil provide from the only me within th testing f	ns of data ity, as well l intended ces in the e (risk ent). ces in the e, data, and hat reflect ms in data ity Dataset ment, sting (see or ces), and e results: The nly e uses vide e FFS nd the ent e. The hybrid e uses an ic health EHR) e from 21 s in the ermanente which inpatient ata tion. Age of in cohort: The nly e includes e FFS , age 65- The hybrid e includes e true true true true true true true true				

	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
	within the hybrid testing form. 5. Exclusion analyses a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure. 6. Meaningf ul differences a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure. Difference between the two measures when fully harmonized, prior to implementation: 1. Risk adjustment: a. The claims-only measure uses administrative claims data only for risk adjustment b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical risk			stroke severity		
Data Source	Claims, Electronic Health Records, Other Clinical- Hybrid Dataset Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all	Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as	Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient	Claims (Only), Other, Registry For measure implementation the data sources will be: 1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee- for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some	Claims While the measure is tested and specified using data from the Healthcare Cost and Utilization Project (HCUP) (see section 1.1 and 1.2 of the measure testing form), the measure specifications and software are specified to be used with any ICD-9-CM- coded administrative billing/claims/disch arge dataset with Present on Admission (POA) information. Note	Electronic administrative data/claims

3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
Hospital-Wide (All-	all-cause, risk-	day, all-cause, risk-	day, all-cause, risk-	Low-Mortality	Selected Conditions
Condition, All-	standardized	standardized	standardized	Diagnosis Related	
Procedure) Risk-	mortality rate (RSMR)	mortality rate	mortality rate	Groups (PSI02)	
Standardized	following acute	(RSMR) following	(RSMR) following		
Mortality Measure	myocardial infarction	heart failure (HF)	acute ischemic		
	(AMI) hospitalization	hospitalization	stroke		
			hospitalization with		
			claims-based risk adjustment for		
			stroke severity		
any of their	claims for the 12	the 12 months prior	well as inpatient	AHRQ QI software	
member hospitals	months prior to an	to an index	and outpatient	will no longer	
between January 1,	index admission.	admission.	physician claims for	support prediction	
2009 and June 30,	2. Medicare	2. Medicare	the 12 months	of POA status using	
2015 was used for	Enrollment Database	Enrollment	prior to an index	an embedded	
measure	(EDB): This database	Database (EDB): This	admission.	prediction module.	
development, as	contains Medicare	database contains	2. Medicare	Users are expected	
described in the	beneficiary	Medicare	Enrollment	to provide POA	
attached	demographic,	beneficiary	Database (EDB):	data.	
methodology	benefit/coverage,	demographic,	This database	Available at	
report).	and vital status	benefit/coverage,	contains Medicare	measure-specific	
The two data	information. This	and vital status	beneficiary	web page URL	
sources listed	data source was used	information. This	demographic,	identified in S.1	
below were used for testing the	to obtain information on several	data source was used to obtain	benefit/coverage, and vital status	Attachment	
claims-based	inclusion/exclusion	information on	information. This	PSI_02_Death_Rate _in_Low-	
measure; the	indicators such as	several	data source was	_In_Low- Mortality_Diagnosis	
hybrid testing form	Medicare status on	inclusion/exclusion	used to obtain	_Related_Groups	
includes some	admission as well as	indicators such as	information on	DRGs	
testing data from	vital status. These	Medicare status on	several	_Editable.xlsx	
the claims-based	data have previously	admission as well as	inclusion/exclusion	-	
measure (for	been shown to	vital status. These	indicators such as		
example, for the	accurately reflect	data have previously	Medicare status on		
social risk factor	patient vital status	been shown to	admission, as well		
and external validation	(Fleming et al., 1992).	accurately reflect	as vital status. These data have		
analyses).	<ol> <li>Veterans Health</li> <li>Administration Data:</li> </ol>	patient vital status (Fleming et al.,	previously been		
HWM claims-only	This data source	(Henning et al., 1992).	shown to		
datasets:	contains claims data	3. Veterans Health	accurately reflect		
Medicare Part A	for VA inpatient and	Administration (VA)	patient vital status		
Inpatient Claims	outpatient services	Data: This data	(Fleming et al.,		
Data	including: inpatient	source contains	1992).		
The index dataset	hospital care,	claims data for VA	3. For measure		
contains	outpatient hospital	inpatient and	development		
administrative	services, skilled	outpatient services	purposes only, we		
inpatient	nursing facility care,	including: inpatient	linked the data		
hospitalization	some home health	hospital care,	sources above with		
data for Medicare	agency services, as	outpatient hospital	data from the		
FFS beneficiaries,	well as inpatient and outpatient physician	services, skilled nursing facility care,	AHA/ASA GWTG- Stroke Registry.		
aged 65-94 on	claims for the 12	some home health	The registry data		
admission. The	months prior to and	agency services, as	were used to		
history dataset includes	including each index	well as inpatient	obtain the National		
administrative	admission. Unlike	and outpatient	Institutes of Health		
inpatient	Medicare FFS	physician claims for	(NIH) Stroke Scale		
hospitalization	patients, VA patients	the 12 months prior	scores and clinical		
data on each	are not required to	to and including	risk variables.		
patient for the 12	have been enrolled in	each index	When this measure		
months prior to the	Part A and Part B	admission. Unlike	is implemented		
index admission.	Medicare for the 12	Medicare FFS	NIH Stroke Scale		
This data was used	months prior to the date of admission.	patients, VA patients are not	scores will be derived from ICD-		
along with the	All-payer data	required to have	10 codes in		
Medicare Enrollment	sources:	been enrolled in	Medicare claims.		
Database (EDB) for	For our analyses to	Part A and Part B	Reference:		
testing the claims-	examine use in all-	Medicare for the 12	Fleming C, Fisher		
based measure.	payer data, we used	months prior to the	ES, Chang CH,		
Medicare	all-payer data from	date of admission.	Bubolz TA, Malenka		
Enrollment	California in addition	All-payer data	DJ. Studying		
Database (EDB)	to CMS data for	sources:	outcomes and		
This database	Medicare FFS 65+	For our analyses to	hospital utilization		
contains Medicare	patients in California	examine use in all-	in the elderly: The		
beneficiary	hospitals. California is a diverse state, and,	payer data, we used all-payer data from	advantages of a merged data base		
demographic,	with more than 37	California in	for Medicare and		
benefit/coverage,	million residents,	addition to CMS	Veterans Affairs		
and vital status	California represents	data for Medicare	hospitals. Medical		
information. This data source was	12% of the US	FFS 65+ patients in	Care. 1992; 30(5):		
used to obtain	population. We used	California hospitals.	377-91. Data		
information on	the California Patient	California is a	sources for the all-		
several	Discharge Data, a	diverse state, and,	payer update		
inclusion/exclusion	large, linked	with more than 37	No data collection		
indicators such as	database of patient	million residents,	instrument		
Medicare status on	hospital admissions.	California	provided		
admission as well	In 2006, there were approximately 3	represents 12% of the US population.	Attachment		
as vital status. It	million adult	We used the	NQF_2876_Claims-		
was also used to	discharges from	California Patient	Only_Stroke_Morta		
determine hospice enrollment.	more than 450 non-	Discharge Data, a	lity_S2b_Mortality_ Data_Dictionary_v1		
en onnent.	-	- , ·			

	3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
	Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for	Low-Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
	No data collection instrument provided Attachment Del18b2HOP5HW MHybridDataDictio nary01072019.xlsx	Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records). Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the AMI mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission. References: Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91. No data collection instrument provided Attachment NQF_0230_AMI_Mor tality_Data_Dictionar y_Final- 63697330064376210 6.xlsx	large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non- Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records). Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the HF mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference: Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospital S. Medicare and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospital S. Medical Care. 1992; 30(5): 377-91. No data collection instrument provided Attachmery SUCA Nofala collection instrument provided Attachmery SUCA Nofala collection instrument provided Attachmery SUCA Nofala collection instrument provided Attachmery SUCA Nofala collection	stroke severity .0- 635884757617681 755.xlsx		
Level	Facility	Facility	Facility	Facility	Facility	Facility/Agency
Setting	Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest	Inpatient/Hospital	Inpatient/Hospital, Other Hospital & Hospital: Acute Care Facility	Hospital	Inpatient/Hospital	Hospital

	3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
	Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	Low-Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
	Home or Custodial Care Services					
Numerator Statement	The outcome for this measure is 30- day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.	The outcome for this measure is 30-day all- cause mortality. We define mortality as death from any cause within 30 days from the date of admission for patients discharged from the hospital with a principal diagnosis of AMI. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30- day all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients 65 and older discharged from the hospital with a principal diagnosis of HF. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30- day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for patients with a principal discharge diagnosis of acute ischemic stroke.	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.	Number of in- hospital deaths
Numerator Details	The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.	Outcome definition This measure counts death from any cause within 30 days after the index admission date. Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality. (Simoes et al., 2018; Dharmarajan et al., 2015). Identifying deaths in the Medicare FFS population As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB). Identifying deaths in the all-payer population For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post- discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control	Numerator Details.Outcome DefinitionThe measure countsdeaths for any causewithin 30 days ofthe date ofadmission of theindex HFhospitalization.Rationale: From apatient perspective,death is a criticaloutcome regardlessof cause. Outcomesoccurring within 30days of the start ofthe admission canbe influenced byhospital care andearly transition tothe non-acute caresetting. The 30-daytime frame is aclinically meaningfulperiod for hospitalsto collaborate withtheir communitiesto reduce mortality(Simoes et al., 2017;Dharmarajan et al.,2015).Identifying deaths inthe FFS measureAs currentlyreported, weidentify deaths forFFS Medicarepatients 65 yearsand older in theMedicareEnrollmentDatabase (EDB).Identifying deaths inthe all-payermeasureFor the purposes ofdevelopment of anall-payer measure,deaths wereidentified using theCalifornia vitalstatistics data file.Nationally, post-discharge deathscan be identifiedusing an externalsource of vitalstatus, such as theSocial Security <td>The measure outcome is death from any cause within 30 days of the index admission date. As currently specified, we identify deaths for FFS Medicare patients, age 65 years and older, in the Medicare Enrollment Database (EDB).</td> <td>Not applicable</td> <td>Number of in-hospital deaths for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.quality indicators.ahrq.gov/ Modules/IQI_TechS pec.aspx).</td>	The measure outcome is death from any cause within 30 days of the index admission date. As currently specified, we identify deaths for FFS Medicare patients, age 65 years and older, in the Medicare Enrollment Database (EDB).	Not applicable	Number of in-hospital deaths for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.quality indicators.ahrq.gov/ Modules/IQI_TechS pec.aspx).

	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
		National Death Index (NDI). Reference: 1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk- Standardized Mortality Measures. http://www.qualityn et.org/dcs/ContentSe rver?c=Page&pagena me=QnetPublic/Page /QnetTier3&cid=1163 010421830. Accessed May 4, 2018.	Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI). Reference: 1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition-Specific Measures Updates and Specifications Report Hospital- Level 30-Day Risk- Standardized Mortality Measures. http://www.quality net.org/dcs/Content Server?c=Page&pag ename=QnetPublic/ Page/QnetTier3&cid =1163010421830. Accessed June 7, 2017. 2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h4 11			
Denominator Statement	The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.	This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups. The cohort includes admissions for patients discharged from the hospital with a principal discharge diagnosis of AMI and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non- federal hospitals or patients admitted to VA hospitals. Additional details are provided in S.7 Denominator Details.	This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have explicitly tested the measure in both age groups. The cohort for the publically reported measure includes admissions for patients aged 65 years and older discharged from the hospital with a principal discharge diagnosis of HF and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non- federal hospitals or patients admitted to VA hospitals. Additional details are provided in S.7 Denominator Details.	The cohort includes inpatient admissions to all non-federal, short- term, acute care hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke. Additional details are provided in S.9 Denominator Details.	Discharges, for patients ages 18 years and older or MDC 14 (pregnancy, childbirth, and puerperium), with a low-mortality (less than 0.5% mortality) MS-DRG code (LOWMODR). If an MS-DRG is divided into "without/with (major) complications and comorbidities," both codes without complications/com orbidities and codes with (major) complications/com orbidities must have mortality rates below 0.5% in the reference population to qualify for inclusion.	Number of eligible discharges (all indicators are limited to the adult population)

	2502 Hybrid	0220 Hospital 20-day	0229 Hospital 30-	2876 Hospital 30-	0247 Death Pate in	0520 Mortality for
	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
Denominator Details	The index cohortincludes allinpatientadmissions forpatients aged 50-94 years old. (Note:The intention is tofully harmonize thecohort definitionwith the claims-only measure sothat both measureswill captureadmissions forpatients age 65-94.We deviated fromthat definitionduringdevelopment andtesting due to thelimited datasetavailable thatincluded the EHRdata elementsneeded tocalculate thismeasure. Note thatthe risk modelalready includesage in years, as arisk variable.)An index admissionis thehospitalization towhich the mortalityoutcome isattributed andincludesadmissions forpatients:1. Not transferredfrom another acutecare facilityRationale:Admissions to anacute cate hospitalwithin one day ofdischarge fromanother acute carehospital areconsideredtransfers.Transferredpatients areincluded in themeasure cohort,but it is the initialhospitalizationrather than any"transfer-in"hospitalizationto which the emortality <td< td=""><td>To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Having a principal discharge diagnosis of AMI; 2. Enrolled in Medicare FFS Part A and Part B for the first 12 months prior to the date of admission, enrolled in Part A during the index admission, or those who are VA beneficiaries; 3. Aged 65 or over; and 4. Not transferred from another acute care facility. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.</td><td>To be included in the HF measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Have a principal discharge diagnosis of heart failure (HF); 2. Enrolled in Medicare Fee-For- Service (FFS)Part A and Part B for the 12 months prior to the date of the index admission and Part A during the index admission, or those who are VA beneficiaries (in the cases of the AMI, HF, and pneumonia measures); 3. Aged 65 or over; and, 4. Not transferred from another acute care facility. VA beneficiaries are eligible for inclusion in the AMI, HF, and pneumonia measure cohorts regardless of Medicare FFS enrollment or whether they were hospitalized in a VA or non-VA short- term acute care hospital. This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.</td><td>The denominator includes all Medicare FFS beneficiaries, age 65 and over, with a principal discharge diagnosis of acute ischemic stroke. To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Enrolled in Medicare fee-for- service (FFS) during the index admission; 2. Not transferred from another acute care facility; and 3. Enrolled in Part A and Part B Medicare for the 12 months prior to the date of index admission. ICD-9-CM codes that define the patient cohort: 433.01 Occlusion and stenosis of basilar artery with cerebral infarction 433.11 Occlusion and stenosis of carotid artery with cerebral artery with cerebral infarction 433.31 Occlusion and stenosis of vertebral artery with cerebral infarction 433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction 433.91 Occlusion and stenosis of vertebral artery with cerebral infarction 433.91 Occlusion and stenosis of vertebral artery with cerebral infarction 433.91 Occlusion and stenosis of other specified precerebral artery with cerebral arteries with cerebral infarction 433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral artery with cerebral infarction 434.01 Cerebral thrombosis with cerebral infarction 434.91 Cerebral artery occlusion, unspecified with cerebral infarction 434.91 Cerebral artery occlusion, unspecified with cerebral infarction 436 Acute, but ill-defined,</td><td>LOWMODR: Low- mortality (less than 0.5%) MS-DRG codes (See attached technical specifications for detailed list of codes.)</td><td>Number of eligible adult discharges for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.quality indicators.ahrq.gov/ Modules/IQI_TechS pec.aspx).</td></td<>	To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Having a principal discharge diagnosis of AMI; 2. Enrolled in Medicare FFS Part A and Part B for the first 12 months prior to the date of admission, enrolled in Part A during the index admission, or those who are VA beneficiaries; 3. Aged 65 or over; and 4. Not transferred from another acute care facility. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.	To be included in the HF measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Have a principal discharge diagnosis of heart failure (HF); 2. Enrolled in Medicare Fee-For- Service (FFS)Part A and Part B for the 12 months prior to the date of the index admission and Part A during the index admission, or those who are VA beneficiaries (in the cases of the AMI, HF, and pneumonia measures); 3. Aged 65 or over; and, 4. Not transferred from another acute care facility. VA beneficiaries are eligible for inclusion in the AMI, HF, and pneumonia measure cohorts regardless of Medicare FFS enrollment or whether they were hospitalized in a VA or non-VA short- term acute care hospital. This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.	The denominator includes all Medicare FFS beneficiaries, age 65 and over, with a principal discharge diagnosis of acute ischemic stroke. To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Enrolled in Medicare fee-for- service (FFS) during the index admission; 2. Not transferred from another acute care facility; and 3. Enrolled in Part A and Part B Medicare for the 12 months prior to the date of index admission. ICD-9-CM codes that define the patient cohort: 433.01 Occlusion and stenosis of basilar artery with cerebral infarction 433.11 Occlusion and stenosis of carotid artery with cerebral artery with cerebral infarction 433.31 Occlusion and stenosis of vertebral artery with cerebral infarction 433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction 433.91 Occlusion and stenosis of vertebral artery with cerebral infarction 433.91 Occlusion and stenosis of vertebral artery with cerebral infarction 433.91 Occlusion and stenosis of other specified precerebral artery with cerebral arteries with cerebral infarction 433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral artery with cerebral infarction 434.01 Cerebral thrombosis with cerebral infarction 434.91 Cerebral artery occlusion, unspecified with cerebral infarction 434.91 Cerebral artery occlusion, unspecified with cerebral infarction 436 Acute, but ill-defined,	LOWMODR: Low- mortality (less than 0.5%) MS-DRG codes (See attached technical specifications for detailed list of codes.)	Number of eligible adult discharges for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.quality indicators.ahrq.gov/ Modules/IQI_TechS pec.aspx).

3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
Hospital-Wide (All-	all-cause, risk-	day, all-cause, risk-	day, all-cause, risk-	Low-Mortality	Selected Conditions
Condition, All-	standardized	standardized	standardized	Diagnosis Related	
Procedure) Risk-	mortality rate (RSMR)	mortality rate	mortality rate	Groups (PSI02)	
Standardized	following acute	(RSMR) following	(RSMR) following		
Mortality Measure	myocardial infarction	heart failure (HF)	acute ischemic		
	(AMI) hospitalization	hospitalization	stroke		
			hospitalization with		
			claims-based risk		
			adjustment for		
			stroke severity		
required that we			cerebrovascular		
expand the sample			disease		
by including			ICD-10 codes that		
admissions from			define the patient		
patients ages 50 to 94 years. Note that			cohort:		
the measure			163.22 Cerebral		
already adjusts for			infarction due to		
age.			unspecified occlusion or		
3. Not admitted for			stenosis of basilar		
primary psychiatric			arteries		
diagnoses			163.139 Cerebral		
Rationale: Patients			infarction due to		
admitted for			embolism of		
psychiatric			unspecified carotid		
treatment are			artery		
typically cared for			I63.239 Cerebral		
in separate			infarction due to		
psychiatric facilities that are not			unspecified		
comparable to			occlusion or		
short-term acute			stenosis of		
care hospitals (see			unspecified carotid arteries		
data dictionary,					
HWM Non-Acute			I63.019 Cerebral infarction due to		
Care Inclusion tab).			thrombosis of		
4. Not admitted for			unspecified		
rehabilitation			vertebral artery		
Rationale: These			163.119 Cerebral		
admissions are not			infarction due to		
typically to a short-			embolism of		
term acute care			unspecified		
hospital and are not for acute care			vertebral artery		
(see data			I63.219 Cerebral		
dictionary, HWM			infarction due to		
Non-Acute Care			unspecified		
Inclusion tab).			occlusion or stenosis of		
5. Not enrolled in			unspecified		
hospice at the time			vertebral arteries		
of, or 12 months			163.59 Cerebral		
prior to, their index			infarction due to		
admission			unspecified		
Rationale: Patients			occlusion or		
enrolled in hospice			stenosis of other		
in the prior 12 months or at the			cerebral artery		
time of admission			163.20 Cerebral		
are unlikely to have			infarction due to		
30-day survival as a			unspecified		
primary goal			occlusion or		
6. Not enrolled in			stenosis of unspecified		
hospice within two			precerebral		
days of admission			arteries		
Rationale: There is			I63.30 Cerebral		
not a single,			infarction due to		
correct approach			thrombosis of		

correct approach regarding patients enrolled in hospice during admission or upon discharge - mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the

thrombosis of unspecified cerebral artery I63.40 Cerebral infarction due to embolism of unspecified cerebral artery 163.50 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery I67.8 Other specified cerebrovascular diseases

3502 Hybrid Hospital-Wide (All-	0230 Hospital 30-day, all-cause, risk-	0229 Hospital 30- day, all-cause, risk-	2876 Hospital 30- day, all-cause, risk-	0347 Death Rate in Low-Mortality	0530 Mortality for
Condition, All-	standardized	standardized	standardized	Diagnosis Related	Selected Conditions
Procedure) Risk-	mortality rate (RSMR)	mortality rate	mortality rate	Groups (PSI02)	
Standardized	following acute	(RSMR) following	(RSMR) following acute ischemic		
Mortality Measure	myocardial infarction (AMI) hospitalization	heart failure (HF) hospitalization	stroke		
	(*****)		hospitalization with		
			claims-based risk		
			adjustment for stroke severity		
primary goal due to			167.89 Other		
their condition and			cerebrovascular		
not the quality of care received.			diseases An ICD-9 to ICD-10		
7. Not with a			crosswalk is		
principal diagnosis			attached in field		
of cancer and enrolled in hospice			S.2b. (Data Dictionary or Code		
during their index			Table).		
admission					
Rationale: Patients admitted primarily					
for cancer who are					
enrolled in hospice					
during admission are unlikely to have					
30-day survival as a					
primary goal of					
care. (see data dictionary, HWM					
Cancer Inclusion					
tab).					
8. Without any diagnosis of					
metastatic cancer					
Rationale:					
Although some patients admitted					
with a diagnosis of					
metastatic cancer will have 30-day					
survival as a					
primary goal of					
care, for many such patients admitted					
to the hospital,					
death may be a					
clinically reasonable and					
patient-centered					
outcome. (see data dictionary, HWM					
Metastatic Cancer					
Inclusion tab).					
9. Not with a principal discharge					
principal discharge diagnosis, or a					
secondary					
diagnosis that is present on					
admission (POA)					
for a condition					
which hospitals have limited ability					
to influence					
survival Pationalo:					
Rationale: Hospitals have					
little ability to					
impact mortality for some					
conditions. This list					
of conditions (see					
data dictionary, HWM ICD-10					
Inclusion tab) was					
determined					
through independent					
review, by several					
clinicians, of conditions					
associated with					
high mortality. The					
decisions were also reviewed with our					
Technical Expert					
Panel (TEP) and					
Technical Work					

3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
Hospital-Wide (All-	all-cause, risk-	day, all-cause, risk-	day, all-cause, risk-	Low-Mortality	Selected Conditions
Condition, All-	standardized	standardized	standardized	Diagnosis Related	
Procedure) Risk-	mortality rate (RSMR)	mortality rate	mortality rate	Groups (PSI02)	
Standardized	following acute	(RSMR) following	(RSMR) following		
Mortality Measure	myocardial infarction (AMI) hospitalization	heart failure (HF) hospitalization	acute ischemic stroke		
			hospitalization with		
			claims-based risk		
			adjustment for		
Group. Admissions			stroke severity		
are not included in					
the cohort if the					
patient had a					
principal diagnosis code that is on this					
list, or a secondary					
code with POA that					
is on the list.					
In addition, for patients with					
multiple					
admissions, the					
measure selects					
only one admission, at					
random, for					
inclusion. There is					
no practical statistical modeling					
approach that can					
account or adjust					
for the complex					
relationship between the					
number of					
admissions and risk					
of mortality in the					
context of a hospital-wide					
mortality measure.					
Random selection					
ensures that providers are not					
penalized for a					
"last" admission					
during the					
measurement period; selecting					
the last admission					
would not be as					
accurate a					
reflection of the risk of death as					
random selection,					
as the last					
admission is inherently					
associated with a					
higher mortality					
risk. Random					
selection is also used in CMS's					
condition-specific					
mortality					
measures. Note that random					
selection reduces					
the number of					
admissions, but					
does not exclude any patients from					
the measure.					
The cohort is					
defined using ICD-					
10 Clinical Modification codes					
identified in					
Medicare Part A					
Inpatient claims					
data. The measure aggregates the ICD-					
10 principal					
diagnosis and all					
procedure codes of					
the index admission into					
clinically coherent					
groups of					
conditions and					

3502 Hybrid Hospital-Wide (All-	0230 Hospital 30-day, all-cause, risk-	0229 Hospital 30- day, all-cause, risk-	2876 Hospital 30- day, all-cause, risk-	0347 Death Rate in Low-Mortality	0530 Mortality for Selected Conditions
Condition, All- Procedure) Risk- Standardized Mortality Measure	standardized mortality rate (RSMR) following acute myocardial infarction	standardized mortality rate (RSMR) following heart failure (HF)	standardized mortality rate (RSMR) following acute ischemic	Diagnosis Related Groups (PSI02)	Selected Conditions
	(AMI) hospitalization	hospitalization	stroke hospitalization with claims-based risk adjustment for		
procedures			stroke severity		
(condition					
categories or procedure					
categories) using					
the Agency for Healthcare					
Research and					
Quality (AHRQ) Clinical					
Classifications					
System (CCS).					
There is a total of 285 mutually					
exclusive AHRQ					
condition categories, most of					
which are single,					
homogenous diseases such as					
pneumonia or					
acute myocardial infarction. Some					
are aggregates of					
conditions, such as "other bacterial					
infections". There					
is a total of 231 mutually exclusive					
procedure					
categories. Using the AHRQ CCS					
procedure and					
condition categories, the					
measure assigns					
each index hospitalization to					
one of 15 mutually					
exclusive divisions. The divisions were					
created based					
upon clinical coherence,					
consistency of					
mortality risk, adequate patient					
and hospital case					
volume for stable results reporting,					
and input from					
clinicians, patients, and patient					
caregivers on					
usability. The measure first					
assigns admissions					
with qualifying					
AHRQ procedure categories to one					
of six surgery divisions by					
identifying a					
defining surgical procedure. The					
defining surgical					
procedure is identified using the					
following					
algorithm: 1) if a patient only has					
one major surgical					
procedure then that procedure is					
that procedure is the defining					
surgical procedure;					
<ol><li>if a patient has more than one</li></ol>					
major surgical					
procedure, the first					

1						
	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
	dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams. The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures. For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel. The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non- surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions. The full list of the spacific diagnosis are atached in the					
Exclusions	Data Dictionary. The measure excludes index	The mortality measure excludes index hospitalizations	The HF mortality measure excludes index	The measure excludes	Exclude cases: • with any listed ICD-10-CM	Indicator specific

Ho Co Pr Sta	502 Hybrid ospital-Wide (All- ondition, All- rocedure) Risk- candardized lortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
pa 1. ind um sta da um da 2. ag ad 3. ad sp (Cr far 22 Inj Cr int 23 of (Cr bu an 4. di bu ad bu cr int ad bu cr int ad bu cr int ad bu cr int ad ad bu cr int ad ad ad ad ad ad ad ad ad ad	atients: With consistent or nknown vital catus (from claims ata) or other nreliable claims ata; Discharged gainst medical dvice (AMA); With an dmission for binal cord injury CCS 227), skull and ce fractures (CCS 28), Intracranial njury (CCS 233), rushing injury or iternal injury (CCS 34), Open wounds f head/neck/trunk CCS 235), and urns (CCS 240); nd With a principal ischarge diagnosis ithin a CCS with ewer than 100 dmissions in that ivision within the neasurement year.	that meet any of the following exclusion criteria: 1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility; 2. Inconsistent or unknown vital status or other unreliable demographic (age and gender) data; 3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission, or 4. Discharged against medical advice (AMA). For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admissions are excluded to avoid assigning a single death to two	hospitalizations that meet any of the following exclusion criteria: 1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; 2. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission; or, 3. Discharged against medical advice. 4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility; or 5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.	admissions for patients: 1. With inconsistent or unknown vital status or other unreliable data; 2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission; and 3. Discharged against medical advice (AMA). For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.	diagnosis codes for trauma (Appendix G: TRAUMID) • with any listed ICD-10-CM diagnosis codes for cancer (Appendix H: CANCEID) • with any listed ICD-10-CM diagnosis codes for immunocompromis ed state (Appendix I: IMMUNID) • with any listed ICD-10-PCS procedure codes for immunocompromis ed state (Appendix I: IMMUNIP) • transfer to an acute care facility (DISP=2) • with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), or principal diagnosis (DX1=missing)	

		admissions.				
Exclusion Details	<ol> <li>With inconsistent or unknown vital status (from claims data) or other unreliable claims data.</li> <li>Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are</li> </ol>	<ol> <li>Discharged alive         <ul> <li>Discharged alive</li> <li>on the day of</li> <li>admission or the</li> <li>following day who</li> <li>were not transferred</li> <li>to another acute care</li> <li>facility. Discharges</li> <li>are identified using</li> <li>data from the claims.</li> </ul> </li> <li>Rationale: It is         <ul> <li>unlikely that these</li> <li>patients had clinically</li> <li>significant AMI.</li> <li>Inconsistent or</li> <li>unknown vital status</li> <li>or other unreliable</li> <li>demographic data</li> <li>Rationale: We do not</li> <li>include stays for</li> <li>patients where the</li> <li>age is greater than</li> </ul> </li> </ol>	1. Inconsisten t or unknown vital status or other unreliable demographic data Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male'	1. Inconsistent vital status or unreliable data: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.	Appendix G: Trauma Diagnosis Codes Appendix H: Cancer Diagnosis Codes Appendix I: Immunocompromis ed State Diagnosis and Procedure Codes (See attached Appendix G, Appendix H, and Appendix I for detailed list of codes.)	See Inpatient Quality Indicators: Technical Specifications for additional details (available at http://www.qualityi ndicators.ahrq.gov/ Modules/IQI_TechS pec.aspx).

death to two

3920 Hybrid Mide (AL)       0/20 Hospital 30-day, all clasus, risk-standardzed mortality rate (RSMR) following actual my rougo-ratial infaction (AM) hospitalization       28/6 Hospital 30-discuss, risk-standardzed mortality rate (RSMR) following actual my rougo-ratial infaction (AM) hospitalization       29/6 Hospital 30-discuss, risk-standardzed mortality rate (RSMR) following actual my rougo-ratial infaction (AM) hospitalization       29/6 Hospital 30-discuss, risk-standardzed mortality rate (RSMR) following actual my rougo-ratial infaction (AM) hospitalization       29/6 Hospital 30-discuss, risk-standardzed mortality rate (RSMR) following actual my rougo-ratial rate (RSMR) following actual my rougo-rate (RSMR) following actual m	
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Millin putchessignal of poor quality care.standard analytic file (SAF). Thismutually independent withconditions. These conditions are also4. Discharged against medical advice.standard analytic file (SAF). Thismutually independent withinfrequent events that are unlikely to be uniformly distributed acrossmedical advice.when the measure is used in Medicareprobability of the outcome. For each patient, thedistributed across hospitals.claimsRationale: These patients are likely did not have the opportunity to deliver full care andpatients are likely only; thus, mortalitydeath increases subsequent admission, and	
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condutions are unservedmedical advice.when the measureprobability of theinfrequent eventsDischarge status isis used in Medicareoutcome. For eachthat are unlikely toDischarge status isis used in Medicareoutcome. For eachbe uniformlyidentified using theFFS patients only.patient, thedistributed acrossclaimsRationale: Theseprobability ofhospitals.Rationale: Providerspatients are likelydeath increases4. With a principaldid not have thecontinuing to seekwith eachdischarge diagnosisopportunity tocomfort measuressubsequentwithin a CCS withdeliver full care andonly; thus, mortalityadmission, and	
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within a CCS with deliver full care and only; thus, mortality admission, and	
admissions in thatfor discharge.adverse outcome orepisodes of caredivision within theAfter exclusions #1-4signal of poorare not mutually	
measurement year. are applied, the quality care. independent.	
Rationale: Tomeasure randomly3.DischargedSimilarly, for thecalculate a stableselects one indexagainst medicalthree year	
calculate a stableselects one indexagainst medicalthree yearand precise riskadmission per patientadvicecombined data,	
model, there are a per year for inclusion Discharges against when index	
minimum numberin the cohort so thatmedical advice areadmissions occurof admissions thateach episode of careidentified using theduring the	
are needed. In is mutually discharge transition between	
addition, aindependent with thedispositionmeasure reportingminimum numbersame probability ofindicator.periods (June and	
of admissions the outcome. Rationale: Providers July of each year)	
and/or outcome Additional did not have the and both are	
events are requiredadmissions within that year areopportunity to deliver full care andrandomly selectedto inform groupingthat year are that year aredeliver full care and that year arefor inclusion in the	
admissions into excluded. For each prepare the patient measure, the	
larger categories.patient, thefor discharge.measure includesThese admissionsprobability of death4Dischargedonly the June	
present challenges increases with each alive on the day of admission. The July	
to both accurate subsequent admission or the admissions are	
risk prediction and coherent riskadmission and therefore the therefore the therefore thefollowing day who were notexcluded to avoid assigning a single	
grouping and are episodes of care are transferred to death to two	
therefore     not mutually     another acute care     admissions.       excluded.     independent.     facility. The	
Note: During For the three-year discharge	
measure combined data, when disposition indicator	
development weindex admissionsis used to identifyanalyzed differentoccur during thepatients alive at	
volume cut-offs     transition between     discharge. Transfers	

3202 Hybrid Rockshor Res.       0243 Hospital Body, Rockshor Res.       0244 Hospital Body, Rockshor Res.       0243 Hospital	 					
Cb. So and LOL Using cut-off walks to before 100 many VCS tools: started for intercutors adjustment of the division (the CCS Category Code are used in risk adjustment off the division the convergence off the code vision-twent risk modes: The adjustment off the division the code vision-twent adjustment off the division the code vision-twent risk modes: The adjustment off the division the code vision-twent risk modes: The adjustment off the division-twent risk modes: The adjustment off the adjustment division-twent risk modes: The adjustment off the adjustment off the adjustment division-twent off the adjustment off the adj	Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized	all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction	day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF)	day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk	Low-Mortality Diagnosis Related	
regulated in took some of the measure, the incurst in the measure, the incurst induces are hospital and measure activates are hospital convergence of the measure induces in the measure induces activates are hospital in the measure induces convergence of the solution and the same degren excluded to avoid a distinguing significant induces first induces first induces first induces for total number of particles in the solution and the same degren excluded to avoid a distinguing significant induces for total number of particles in the solution and the same degren excluded to avoid a distinguing significant induces for total number of particles in the solution and the same degren excluded to avoid a distinguing significant induces for total of of 100, During measure development we also explored the solution and group, however, the hetersgenetity inmovable addition and group however, the hetersgenetity indicest addition and group however, the hetersgenetity indicest addition and group however, the hetersgenetity indicest addition and group however, the hetersgenetity indicest addition and in the group however, the hetersgenetity indicest addition and and group however, the hetersgenetity indicest addition and the group however, the hetersgenetity indicest addition the basess addition the the same broubbility indigeneters whithe	Using cut-off	periods (June and	claims when a			
probability of death	Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non- convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these	periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. July admissions are excluded to avoid assigning a single death to two	claims when a patient with a qualifying admission is discharged from an acute care hospital and admitted to another acute care hospital on the same day or next day. Rationale: It is unlikely that these patients had clinically significant HF. 5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission Patients with LVAD implantation or heart transplantation during an index admission or in the previous 12 months are identified by the corresponding codes for these procedures included in claims data. Rationale: These patients represent a clinically distinct group (ICD-10-PCS code list). The data sources for these analyses are Medicare administrative claims and enrollment information for patients with hospitalizations between July 1, 2013 and June 30, 2016. After exclusions #1- 5 are applied, the measure randomly selectis one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additiosal admission swithin that year are excluded. For each patient, the	stroke severity		

	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
			episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.			
Risk Adjustment	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model	No risk adjustment or risk stratification	No risk adjustment or risk stratification
Stratification	N/A	N/A	N/A	N/A	Not applicable	
Type Score Algorithm	Rate/proportion better quality = lower score The measure estimates hospital- level, risk- standardized mortality rates (RSMRs) within 30 days of hospital	Rate/proportion better quality = lower score The measure estimates hospital- level 30-day all-cause RSMRs following hospitalization for AMI using hierarchical logistic	Rate/proportion better quality = lower score The measure estimates hospital- level 30-day all- cause RSMRs following hospitalization for HF using hierarchical	Rate/proportion better quality = lower score The measure estimates hospital- level, 30-day, all- cause RSMRs following hospitalization for stroke using	Rate/proportion better quality = lower score Risk adjustment is not currently included in the ICD- 10-CM/PCS v2018 of the AHRQ QI specifications, due to the transition to	
	admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient- level demographic	regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of discharge using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it	logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log- odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific	hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log- odds of mortality within 30 days of index admission using age, selected clinical covariates,	ICD-10-CM/PCS (October 1, 2015). At least one full year of data coded in ICD-10-CM/PCS is needed in order to develop robust risk adjustment models. A full year of ICD- 10-CM/PCS coded all-payer data will not be available until mid-2019. AHRQ will announce an anticipated date as soon as one is known.	
	and clinical characteristics and a random hospital- level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in	models the hospital- specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non- independence) of patients within the same hospital. If there were no	intercept. At the hospital level, it models the hospital- specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non- independence) of patients within the	and a hospital- specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the		

3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
outcomes. We	differences among	same hospital. If	clustering (non-		
estimated a separate	hospitals, then after adjusting for patient	there were no differences among	independence) of patients within the		
hierarchical logistic	risk, the hospital	hospitals, then after	same hospital. If		
regression model	intercepts should be	adjusting for patient	there were no		
for each service-	identical across all	risk, the hospital	differences among		
line division. In order to obtain the	hospitals.	intercepts should be identical across all	hospitals, then after adjusting for		
variance and	The RSMR is calculated as the	hospitals.	patient risk, the		
interval estimates,	ratio of the number	The RSMR is	hospital intercepts		
we fit the	of "predicted" to the	calculated as the	should be identical		
hierarchical model	number of	ratio of the number	across all hospitals.		
under the Bayesian framework along	"expected" deaths, multiplied by the	of "predicted" to the number of	The RSMR is calculated as the		
with the Markov	national unadjusted	"expected" deaths	ratio of the number		
Chain Monte Carlo	mortality rate. For	at a given hospital,	of "predicted" to		
(MCMC) technique.	each hospital, the	multiplied by the	the number of		
Admissions are assigned to one of	numerator of the ratio ("predicted") is	national observed mortality rate. For	"expected" deaths at a given hospital,		
15 mutually	the number of deaths	each hospital, the	multiplied by the		
exclusive divisions	within 30 days	numerator of the	national observed		
(groups of	predicted on the	ratio is the number	mortality rate. For		
discharge condition categories and	basis of the hospital's performance with its	of deaths within 30 days predicted on	each hospital, the numerator of the		
procedure	observed case mix,	the basis of the	ratio is the number		
categories). For	and the denominator	hospital's	of deaths within 30		
each division and	("expected") is the	performance with	days predicted on		
each hospital with patients in that	number of deaths expected on the basis	its observed case mix, and the	the basis of the hospital's		
division, the	of the nation's	denominator is the	performance with		
standardized	performance with	number of deaths	its observed case		
mortality ratio	that hospital's case	expected based on	mix, and the		
(SMR) is calculated as the ratio of the	mix. This approach is analogous to a ratio	the nation's performance with	denominator is the number of deaths		
number of	of "observed" to	that hospital's case	expected based on		
"predicted" deaths	"expected" used in	mix. This approach	the nation's		
to the number of	other types of	is analogous to a	performance with		
"expected" deaths at a given hospital.	statistical analyses. It conceptually allows	ratio of "observed" to "expected" used	that hospital's case mix. This approach		
The predicted	for a comparison of a	in other types of	is analogous to a		
number of deaths	particular hospital's	statistical analyses.	ratio of "observed"		
is based on the	performance given its	It conceptually	to "expected" used		
hospital's performance with	case mix to an average hospital's	allows for a comparison of a	in other types of statistical analyses.		
its observed case	performance with	particular hospital's	It conceptually		
mix and service	the same case mix.	performance given	allows for a		
mix, and is	Thus, a lower ratio	its case mix to an	comparison of a		
calculated by using the coefficients	indicates lower- than-expected	average hospital's performance with	particular hospital's performance given		
estimated by	mortality or better	the same case mix.	its case mix to an		
regressing the risk	quality and a higher	Thus, a lower ratio	average hospital's		
factors and the	ratio indicates	indicates lower-	performance with		
hospital-specific effect on the risk of	higher-than-expected mortality or worse	than-expected mortality rates or	the same case mix. Thus, a lower ratio		
mortality. The	quality.	better quality, and a	indicates lower-		
estimated hospital-	The "predicted"	higher ratio	than-expected		
specific effect for	number of deaths	indicates higher-	mortality rates or		
each cohort is	(the numerator) is	than-expected	better quality, and		

each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix

than-expected (the numerator) is mortality rates or calculated by using worse quality. the coefficients The "predicted" estimated by regressing the risk number of deaths factors and the (the numerator) is hospital-specific calculated by using the coefficients intercept on the risk of mortality. The estimated by estimated hospitalregressing the risk specific effect is factors and the added to the sum of hospital-specific the estimated regression of mortality. The coefficients multiplied by the specific effect is patient characteristics. The the estimated results are log regression transformed and coefficients multiplied by the summed over all patients attributed to patient characteristics. The a hospital to get a

better quality, and a higher ratio indicates higherthan-expected mortality rates or worse quality. The "predicted" number of deaths (the numerator) is the coefficients estimated by intercept on the risk regressing the risk factors and the estimated hospitalhospital-specific intercept on the added to the sum of risk of mortality. The estimated hospital-specific intercept is added to the sum of the estimated regression

calculated by using

3502 Hybrid	0230 Hospital 30-day,	0229 Hospital 30-	2876 Hospital 30-	0347 Death Rate in	0530 Mortality for
Hospital-Wide (All-	all-cause, risk-	day, all-cause, risk-	day, all-cause, risk-	Low-Mortality	Selected Conditions
Condition, All-	standardized	standardized	standardized	Diagnosis Related	
Procedure) Risk-	mortality rate (RSMR)	mortality rate	mortality rate	Groups (PSI02)	
Standardized Mortality Measure	following acute myocardial infarction	(RSMR) following heart failure (HF)	(RSMR) following acute ischemic		
	(AMI) hospitalization	hospitalization	stroke		
			hospitalization with		
			claims-based risk		
			adjustment for stroke severity		
and is obtained in	predicted value. The	results are log	coefficients		
the same manner,	"expected" number	transformed and	multiplied by the		
but a common	of deaths (the denominator) is	summed over all patients attributed	patient characteristics. The		
effect using all hospitals in our	obtained in the same	to a hospital to get a	results are		
sample is added in	manner, but a	predicted value. The	transformed and		
place of the	common intercept	"expected" number	summed over all		
hospital-specific effect. The results	using all hospitals in our sample is added	of deaths (the denominator) is	patients attributed to a hospital to get		
are transformed	in place of the	obtained in the	a predicted value.		
via an inverse logit	hospital specific	same manner, but a	The "expected"		
function and summed over all	intercept. The results are log transformed	common intercept using all hospitals in	number of deaths (the denominator)		
patients in the	and summed over all	our sample is added	is obtained in the		
hospital to get an	patients in the	in place of the	same manner, but		
expected value.	hospital to get an	hospital-specific	a common		
This approach is analogous to a	expected value. To assess hospital	intercept. The results are log	intercept using all hospitals in our		
ratio of "observed"	performance for each	transformed and	sample is added in		
to "expected" used	reporting period, we	summed over all	place of the		
in other types of statistical analyses.	re-estimate the model coefficients	patients in the hospital to get an	hospital-specific intercept. The		
It conceptually	using the years of	expected value. To	results are		
allows a particular	data in that period.	assess hospital	transformed and		
hospital's performance, given	This calculation	performance for each reporting	summed over all patients in the		
its case mix and	transforms the ratio of predicted over	period, we re-	hospital to get an		
service mix, to be	expected into a rate	estimate the model	expected value. To		
compared to an average hospital's	that is compared to	coefficients using	assess hospital performance for		
performance with	the national observed	the years of data in that period.	each reporting		
the same case mix	readmission rate. The	This calculation	period, we re-		
and service mix.	hierarchical logistic	transforms the ratio	estimate the model		
Thus, a lower ratio indicates lower-	regression models are described fully in	of predicted over expected into a rate	coefficients using the years of data in		
than-expected	the original	that is compared to	that period.		
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create a hospital-		Day Mortality			
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the case of the					
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data from 9 of the total 15 divisions					
due to limitations					
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is then multiplied					
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by the national					
by the national observed mortality rate to produce the					

	3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
Submission items	5.1 Identified measures:5a.1 Are specs completely harmonized? Yes5a.2 If not completely harmonized, identify difference, rationale, impact:This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital-wide mortality measure.This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All- Cause Risk- Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patient, this measure is inortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance for specific conditions and procedures. By	5.1 Identified measures: 2431 : Hospital-level, risk- standardized payment associated with a 30-day episode-of-care for Acute Myocardial Infarction (AMI) 1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR) 1891 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization 1551 : Hospital-level 30-day risk- standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (THA) and/or total knee arthroplasty (THA) and/or total knee arthroplasty (TKA) 0506 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following pneumonia hospitalization 0330 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following pneumonia hospitalization 0505 : Hospital 30- day all-cause, risk- standardized readmission rate (RSRR) following heart failure (HF) hospitalization 0505 : Hospital 30- day all-cause risk- standardized readmission rate (RSRR) following heart failure (HF) hospitalization 0505 : Hospital 30- day all-cause risk- standardized readmission rate (RSRR) following heart failure (HF) hospitalization 0505 : Hospital 30- day all-cause risk- standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.	5.1 Identified measures: 0358 : Heart Failure Mortality Rate (IQI 16) 1893 : Hospital 30- Day, all-cause, risk- standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization 0468 : Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization 0230 : Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization 1891 : Hospital 30- day, all-cause, risk- standardized mortality rate (RSRR) following acute myocardial infarction (AMI) hospitalization 1891 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization 1551 : Hospital-level 30-day risk- standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) 0506 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following elective primary total hip arthroplasty (TKA) 0506 : Hospital 30- day, all-cause, risk- standardized readmission rate (RSRR) following pneumonia hospital 30- day, all-cause, risk- standardized readmission rate	5.1 Identified measures: 0467 : Acute Stroke Mortality Rate (IQI 17) 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non- outcome (such as process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non- outcome measures. Furthermore, non- outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who are eligible for that measure (for example, patients who are eligible for that measure (for example, patients who receive a specific procedure). Additionally, this measure and the NQF endorsed Acute Stroke Mortality Rate (IQI 17) (AHRQ) Measure #0467 are complementary and related rather than competing measures. Although they both	5.1 Identified measures: 5a.1 Are specs completely harmonized? 5a.2 If not completely harmonized, identify difference, rationale, impact: not applicable 5b.1 If competing, why superior or rationale for additive value: Not applicable	<ul> <li>5.1 Identified measures:</li> <li>5a.1 Are specs completely harmonized?</li> <li>5a.2 If not completely harmonized, identify difference, rationale, impact:</li> <li>5b.1 If competing, why superior or rationale for additive value:</li> </ul>

will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause **Risk-Standardized** Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-

standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization 0468 : Hospital 30day, all-cause, riskstandardized mortality rate (RSMR) following pneumonia hospitalization 0229 : Hospital 30day, all-cause, riskstandardized mortality rate (RSMR) following heart failure (HF) hospitalization

standardized readmission rate (RSRR) following heart failure (HF) hospitalization 0505 : Hospital 30day all-cause riskstandardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization. 1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR) 5a.1 Are specs completely harmonized? Yes

assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of acute ischemic stroke, the specified outcomes are different. Our measure assesses 30-day mortality, while #0467 assesses inpatient mortality. The 30day mortality and inpatient mortality outcomes each have distinct advantages and uses, which make them

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The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, busined incorport of the sume complementary mortality measure, busined inferent patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patient, whereasSb. 1 f competing, why superior or rationale for additive value: N/AOutcomes. Sb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 frompeting, why superior or rationale for additive value: N/ASb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 frompeting, why superior or rationale for additive value: N/ASb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 for additive value: N/ASb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 for additive value: N/ASb. 1 f competing, why superior or rationale for additive value: N/ASb. 1 for additive value: N/ASb. 1 f competing, why superior or<	-		-			
measure dividesWity superior or rationale for additive value: N/ASb. 1f competing, why superior or rationale for additive value: N/A"specialty cohorts", while the mortality measure uses 15.This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors than readmission is related to patient factors PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWVM measure submitted with this application. PSI-02Sb. 1f competing, why superior or rationale for additive value: N/AWhy subperior or rationale for additive value: N/ASb. 1f competing, why superior or rationale for additive value: N/AThis readmission is related to patient factors. PSI-02 (NQF #0357) is anotherSb. 1f competing, why superior or rationale for additive value: N/AMit subperior readmission is related to patient factors. PSI-02Sb. 1f competing, while the poulation and a different patient population and a different outcome compared with the HWVM measure submitted with this application. PSI-02Sb. 1f competing, why superior or rationale for additive value: N/AHWW measure submitted with this application, PSI-02 captures patients 18 years of age or older, or obstetricSb. 1f competing, why superior or rationale for additive value: N/AHWW measure submitted with this application, PSI-02Sb. 1f competing, while the superior or patients, whereasHWW measure submitted with this applic	The readmission					
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"specialty cohorts", while the mortality measure uses 15.additive value: N/A additive value: This measure looks at a longer outcome time frame (30- days versus in- hospital) and incorporates stroke severity into the readmission is related to patient factors than readmission isadditive value: N/A additive value: This measure looks at a longer outcome days versus in- hospital) and incorporates stroke severity into the risk-model.related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different patient population. PSI-02 competing measure is submitted with this application. PSI-02 competing submitted with this application. PSI-02 competing submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereasadditive value: N/A additive value: N/A additive value: This measure with this newly developed measure with this application, PSI-02	•			• •		
while the mortality measure uses 15.measure looks at a longer outcomeThis is because the risk of mortality is much more closely related to patient factors thanincorporates stroke severity into the readmission is risk-of mathematical and the severity into the readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the submitted with this application. PSI-02 compared with the submitted with this application. PSI-02 compa	-	additive value. N/A	additive value: N/A			
measure uses 15.Ionger outcomeThis is because thetime frame (30-risk of mortality isdays versus in-much more closelyhospital) andrelated to patientincorporates strokefactors thanseverity into thereadmission isrisk-model.related to patientThe currentfactors. PSI-02publicly reported(NCF #0357) ismeasure, Hospitalanother30-Day MortalitycomplementaryFollowing Acutemortality measure,Ischemic Strokewhich captures aHospitalizationdifferent patientMeasure, is apopulation and apotentiallydifferent outcomecompetingcompared with themeasure, It is CMSHWM measureintent to replacesubmitted with thisgiven program withapplication. PSI-02the currentgatures patientsgiven program withby easy of age orthis newlyolder, or obstetricdevelopedpatients, whereasmeasure, which	while the mortality					
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factors thanseverity into the risk-model.readmission isrisk-model.related to patientThe currentfactors. PSI-02publicly reported(NQF #0357) ismeasure, Hospitalanother30-Day MortalitycomplementaryFollowing Acutemortality measure,Ischemic Strokewhich captures aHospitalizationdifferent patientMeasure, is apopulation and apotentiallycompared with themeasure. It is CMSsubmitted with thisthe currentapplication. PSI-02measure in anycaptures patientsgiven program withthe years of age orolderolder, or obstetricpatients, whereaspatients, whereasmeasuremotality, whereasmeasuremeasuremeasuresubmitted whereasmeasuremeasuregiven program withthis newlydevelopedpatients, whereasmeasure	related to patient					
related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas						
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(NQF #0357) is anotherpublicly reported measure, Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalizationwhich captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereaspublicly reported measure, Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalization Measure, is a potentially competing measure. It is CMS intent to replace the current measure in any given program with this newly developed measure which	•					
another30-Day MortalitycomplementaryFollowing Acutemortality measure,Ischemic Strokewhich captures aHospitalizationdifferent patientMeasure, is apopulation and apotentiallycompared with thecompetingHWM measuremeasure. It is CMSsubmitted with thisintent to replaceapplication. PSI-02the currentcaptures patientsgiven program with18 years of age orolder, or obstetricpatients, whereasmeasurewhich captures at the currentmeasuremeasure in anygiven program withthis newlydeveloped	(NQF #0357) is					
Complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereasFollowing Acute Ischemic Stroke Hospitalization Measure, is a potentially competing measure. It is CMS intent to replace the current measure in any given program with this newly developed measure which				-		
which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereasIschemic Ströke Hospitalization Measure, is a potentially competing measure. It is CMS intent to replace measure in any given program with this newly developed measure, which	•			Following Acute		
different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereasHospitalization Measure, is a potentially competing measure. It is CMS intent to replace the current measure in any given program with this newly developed measure, which						
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compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas	• •					
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application. PSI-02       measure in any         captures patients       given program with         18 years of age or       this newly         older, or obstetric       developed         patients, whereas       measure which				•		
captures patients     given program with       18 years of age or     this newly       older, or obstetric     developed       patients, whereas     measure, which						
18 years of age of     this newly       older, or obstetric     developed       patients, whereas     measure, which				,		
patients, whereas				this newly		
				-		
				measure, which		

much more closely	
related to patient	
factors than	
readmission is	
related to patient	
factors. PSI-02	
(NQF #0357) is	
another	
complementary	
mortality measure,	
which captures a	
different patient	
population and a	
different outcome	
compared with the	
HWM measure	
submitted with this	
application. PSI-02	
captures patients	
18 years of age or	
older, or obstetric	
patients, whereas	
the HWM measure	

3502 Hybrid Hospital-Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	0230 Hospital 30-day, all-cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization	0229 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30- day, all-cause, risk- standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
captures patients between the ages of 65 and 94. PSI- 02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in- hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in- hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures. Sb.1 If competing, why superior or rationale for additive value: There are no competing NQF- endorsed measures.			includes stroke severity in the risk model. The Hybrid Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke with Risk Adjustment for Stroke Severity measure is also being submitted to NQF for endorsement. This measure uses a combination of claims and electronic health records (EHR) data for risk adjustment but is otherwise harmonized with the new claims- only measure. It is CMS intent to implement only one of the new stroke mortality measures (this claims-only measure or the hybrid measure) in any given program.		

# Comparison of NQF 3504, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2867, 0347 and 0530

	3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
	Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
	Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
	Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
	Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
	Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
	Mortality Measure		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
	Wiedsure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
teward	Centers for	Centers for	Centers for	Centers for	Centers for	Centers for	Centers for
	Medicare &	Medicare &	Medicare &	Medicare &	Medicare &	Medicare &	Medicare &
	Medicaid	Medicaid Services	Medicaid Services	Medicaid	Medicaid Services	Medicaid	Medicaid
	Services (CMS)	(CMS)		Services (CMS)		Services	Services (CMS)
escription	The measure	For the hospital-	The measure	This measure	This measure	The measure	This measure
	estimates a	wide readmission	estimates a	estimates a	estimates a	estimates a	estimates a
	hospital-level	(HWR) measure	hospital-level risk-	hospital-level,	hospital-level, 30-	hospital-level,	hospital-level,
	30-day hospital-wide	that was previously	standardized complication rate	30-day risk- standardized	day risk- standardized	risk- standardized	30-day risk- standardized
	risk-	endorsed and is	(RSCR) associated	mortality rate	mortality rate	mortality rate	mortality rate
	standardized	used in the	with elective	(RSMR) for	(RSMR) for	(RSMR) for	(RSMR) for
	mortality rate	Hospital Inpatient	primary THA and	patients	patients	patients	patients
	(RSMR),	Quality Reporting	TKA in Medicare	discharged from	discharged from	discharged from	discharged from
	defined as	Program (IQR),	Fee-For-Service	the hospital with	the hospital with	the hospital	the hospital wit
	death from any	the measure	beneficiaries who	a principal	a principal	following a	a principal
	cause within 30	estimates a	are 65 years and	discharge	discharge	qualifying	diagnosis of
	days after the	hospital-level	older. The outcome	diagnosis of	diagnosis of COPD	isolated CABG	acute
	index	risk-standardized	(complication) is	pneumonia,	or a principal	procedure.	myocardial
	admission date,	readmission rate	defined as any one	including	discharge	Mortality is	infarction (AMI)
	for Medicare fee-for-service	(RSRR) of unplanned, all-	of the specified	aspiration	diagnosis of	defined as death	Mortality is
	(FFS) patients	cause	complications	pneumonia or a	respiratory failure	from any cause	defined as deat
	who are	readmission after	occurring from the	principal	with a secondary	within 30 days of	from any cause
	between the	admission for any	date of index	discharge	discharge	the procedure	within 30 days
	ages of 65 and	eligible condition	admission to 90 days post date of	diagnosis of sepsis (not	diagnosis of acute exacerbation of	date of an index CABG admission.	after the index admission date
	94.	within 30 days of	the index admission	severe sepsis)	COPD. Mortality	An index CABG	The Centers for
	Please note	hospital	(the admission	with a secondary	is defined as	admission is the	Medicare &
	that in parallel	discharge. The	included in the	discharge	death from any	hospitalization	Medicaid
	with the claims-	measure reports	measure cohort).	diagnosis of	cause within 30	for a qualifying	Services (CMS)
	only HWM	a single summary	The target	pneumonia	days of the index	isolated CABG	annually report
	measure, we	RSRR, derived	population is	(including	admission date.	procedure	the measure for
	are submitting	from the volume-	patients 18 and	aspiration	The Centers for	considered for	patients who ar
	a hybrid HWM	weighted results of five different	over. CMS annually	pneumonia)	Medicare &	the mortality	65 years and
	measure. Note that ultimately	models, one for	reports the	coded as present	Medicaid Services	outcome. The	older and are
	the claims and	each of the	measure for	on admission	(CMS) annually	measure was	Medicare fee-
	hybrid	following	patients who are 65	(POA). Mortality	reports the	developed using	for-service (FFS)
	measures will	specialty cohorts	years or older, are	is defined as	measure for	Medicare Fee-	beneficiaries
	be harmonized	based on groups	enrolled in fee-for- service (FFS)	death from any cause within 30	patients who are	for-Service (FFS) patients 65	hospitalized in non-federal
	and use the	of discharge	Medicare, and	days of the index	65 years or older and are Medicare	years and older	hospitals or
	same exact	condition	hospitalized in non-	admission date.	fee-for-service	and was tested	patients
	cohort	categories or	federal acute-care	The Centers for	(FFS) beneficiaries	in all-payer	hospitalized in
	specifications.	procedure	hospitals.	Medicare &	hospitalized in	patients 18	Veterans Health
	The intent is	categories: surgery/gynecolo		Medicaid	non-federal acute	years and older.	Administration
	that prior to	gy; general		Services (CMS)	care hospitals		(VA) facilities.
	implementatio n, the two	medicine;		annually reports			
	measures will	cardiorespiratory;		the measure for			
	be exactly the	cardiovascular;		patients who are			
	same, with the	and neurology,		65 years or older			
	exception of	each of which will		and are either			
	the additional	be described in		Medicare fee-			
	risk adjustment	greater detail		for-service (FFS) beneficiaries and			
	added by the	below. The measure also		hospitalized in			
	CCDE in the	indicates the		non-federal			
	hybrid	hospital-level		acute care			
	measure. This is analogous to	standardized risk		hospitals.			
	the currently	ratios (SRR) for					
	endorsed and	each of these five					
	implemented	specialty cohorts.					
	hybrid hospital-	The outcome is					
	wide	defined as					
	readmissions	unplanned					
	measure (NQF	readmission for					
	1789 and NQF	any cause within					
	2879e).	30 days of the					
	Because of the	discharge date for the index					
	homology	admission (the					
	between the	admission (the					
	claims and	included in the					
	hybrid HWM	measure cohort).					
	measures, there is no	A specified set of					
	reason to	planned					
	suspect that	readmissions do					
	the results of	not count in the					
	analyses done	readmission					
		outcome. CMS			1		1

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All- Procedure)	Readmission Measure (HWR)	(RSCR) following elective primary	standardized mortality rate	mortality rate (RSMR) following	Standardized Mortality Rate	standardized mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized Mortality		arthroplasty (THA) and/or total knee	following	obstructive pulmonary	Following	following acute myocardial
Measure		arthroplasty (TKA)	pneumonia hospitalization	disease (COPD)	Coronary Artery Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
for the claims- only measure	annually reports the measure for					
would differ in	patients who are					
any significant	65 years or older,					
way from results of	are enrolled in fee-for-service					
analyses for a	(FFS) Medicare,					
nationally	and hospitalized in non-federal					
representative hybrid	hospitals.					
measure.	For the All-Cause					
Below we highlight the	Readmission (ACR) measure					
differences	version used in					
between the	the Shared					
two measures, including	Savings Program (SSP), the					
specifications,	measure					
data used, and testing which	estimates an Accountable Care					
reflect	Organization					
limitations of data	(ACO) facility- level RSRR of					
availability, as	unplanned, all-					
well as actual intended	cause					
differences in	readmission after admission for any					
the measure	eligible condition					
(risk adjustment).	within 30 days of					
Differences in	hospital discharge. The					
the measure,	ACR measure is					
data, and testing that	calculated using the same five					
reflect	specialty cohorts					
limitations in data availability	and estimates an					
1.	ACO-level standardized risk					
Datase	ratio for each.					
t used for development,	CMS annually					
some testing	reports the measure for					
(see below for differences),	patients who are					
and measure	65 years or older, are enrolled in					
results:	FFS Medicare and					
a. The claims-only	are ACO assigned beneficiaries.					
measure uses	beneficiaries.					
nation-wide Medicare FFS						
claims and the						
enrollment						
database. b. The						
hybrid measure						
uses an electronic						
health record						
(EHR) database						
from 21 hospitals in the						
Kaiser						
Permanente network which						
includes						
inpatient claims						
data information.						
2. Age of						
patients in cohort:						
cohort: a. The						
claims-only						
measure includes						
Medicare FFS						
patients, age						
65-94.						

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
	Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
	Condition, All- Procedure)	Readmission	(RSCR) following elective primary	standardized mortality rate	mortality rate	Standardized	standardized mortality rate
	Risk-	Measure (HWR)	total hip	(RSMR)	(RSMR) following chronic	Mortality Rate (RSMR)	(RSMR)
	Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
	Mortality Measure		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
	Weasure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
	b. The						
	hybrid measure						
	includes all patients age						
	50-94 (see later						
	discussion for						
	justification)						
	3. Extern						
	al empiric						
	validity testing						
	a. Not possible for the						
	hybrid						
	measure, due						
	to limited data availability. We						
	provide results						
	from the						
	claims-only measure within						
	the hybrid						
	testing form.						
	4. Socioe						
	conomic risk						
	factor analyses						
	a. Not possible for the						
	hybrid						
	measure, due						
	to limited data availability. We						
	provide results						
	from the						
	claims-only measure within						
	the hybrid						
	testing form.						
	5. Exclusi						
	on analyses						
	a. To be						
	representative of what we						
	expect the						
	impact would						
	be of the measures'						
	exclusions in a						
	nation-wide sample, we						
	provide the						
	results from						
	the claims-only measure.						
	6.						
	Meani ngful						
	differences						
	a. To be						
	representative of what we						
	expect the						
	range of						
	performance would be in a						
	nation-wide						
	sample, we						
	provide the distribution						
	results from						
	the claims-only						
	measure. Difference						
	between the						
	two measures						
	when fully harmonized,						
L		i	i	1	İ.	<u>i</u>	<u>i</u>

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
	Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
	Condition, All- Procedure)	Readmission Measure (HWR)	(RSCR) following elective primary	standardized mortality rate	mortality rate (RSMR) following	Standardized Mortality Rate	standardized mortality rate
	Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
	Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
	Mortality Measure		and/or total knee arthroplasty (TKA)	pneumonia hospitalization	pulmonary disease (COPD)	Coronary Artery Bypass Graft	myocardial infarction (AMI)
					hospitalization	(CABG) Surgery	hospitalization
	prior to						
	implementatio n:						
	1. Risk						
	adjustment:						
	a. The claims-only						
	measure uses						
	administrative						
	claims data only for risk						
	adjustment						
	b. The						
	hybrid measure						
	adds 10 clinical risk variables,						
	derived from a						
	set of core						
	clinical data elements						
	(CCDE)						
	extracted from the EHR.						
Туре	Outcome	Outcome	Outcome	Outcome	Outcome	Outcome	Outcome
Data	Claims,	Claims Data	Claims, Other,	Claims, Other,	Claims, Other,	Claims Data	Claims, Other,
Source	Enrollment	sources for the	Paper Medical	Paper Medical	Paper Medical	sources for the	Paper Medical
	Data, Other	Medicare FFS	Records Data	Records Data	Records Data	Medicare FFS	Records Data
	Data sources for the	measure: HWR	sources: The currently	sources for the Medicare FFS	sources for the Medicare FFS	measure: Medicare Part A	sources for the Medicare FFS
	Medicare FFS	1. Medicare Part	publically reported	measure:	measure:	inpatient and	measure:
	measure:	A claims data for	measure is specified	1. Medicare Part	1. Medicare Part	Part B	1. Medicare Part
	1. Medicare Part A	calendar years 2007 and 2008	and has been tested using:	A inpatient and Part B	A inpatient and Part B outpatient	outpatient claims: This data	A inpatient and Part B
	Inpatient: The	were combined	1. Medicare Part A	outpatient	claims: This data	source contains	outpatient
	index dataset	and then	inpatient and Part B	claims: This data	source contains	claims data for	claims: This data
	contains administrative	randomly split into two equal	outpatient claims: This data source	source contains claims data for	claims data for FFS inpatient and	FFS inpatient and outpatient	source contains claims data for
	inpatient	subsets	contains claims data	FFS inpatient	outpatient	services	fee-for service
	hospitalization	(development	for FFS inpatient	and outpatient	services	including:	inpatient and
	data for Medicare FFS	sample and validation	and outpatient services including:	services including:	including: Medicare	Medicare inpatient	outpatient services
	beneficiaries,	sample). Risk	Medicare inpatient	Medicare	inpatient hospital	hospital care,	including:
	aged 65-94 on admission,	variable selection	hospital care,	inpatient	care, outpatient hospital services,	outpatient hospital services,	Medicare
	hospitalized	was done using the development	outpatient hospital services, as well as	hospital care, outpatient	as well as	as well as	inpatient hospital care,
	from July 1,	sample, the risk	inpatient and	hospital services,	inpatient and	inpatient and	outpatient
	2016-June 30, 2017. The	models for each	outpatient	as well as inpatient and	outpatient physician claims	outpatient physician claims	hospital services, skilled nursing
	history dataset	of the five specialty cohorts	physician claims for the 12 months prior	outpatient	for the 12 months	for the 12	facility care,
	includes	in the measure	to an index	physician claims	prior to an index	months prior to	some home
	administrative inpatient	were applied to the validation	admission.	for the 12 months prior to	admission. 2. Medicare	an index admission.	health agency services, as well
	hospitalization	sample and the	2. Medicare Enrollment	an index	2. Medicare Enrollment	Medicare	as inpatient and
	data on each	models'	Database (EDB):	admission.	Database (EDB):	Enrollment	outpatient
	patient for the 12 months	performance was compared. In	This database	2. Medicare Enrollment	This database contains	Database (EDB): This database	physician claims for the 12
	prior to the	addition we re-	contains Medicare beneficiary	Database (EDB):	Medicare	contains	months prior to
	index admission	tested the models	demographic,	This database	beneficiary	Medicare	an index
	admission. 2. Medicare	in Medicare Part A claims data	benefit/coverage,	contains Medicare	demographic, benefit/coverage,	beneficiary demographic,	admission. 2. Medicare
	Enrollment	from calendar	and vital status information. This	beneficiary	and vital status	benefit/coverag	Enrollment
	Database	year 2009 to look	data source was	demographic,	information. This	e, and vital	Database (EDB):
	(EDB): This database	for temporal stability in the	used to obtain information on	benefit/coverag e, and vital	data source was used to obtain	status information. This	This database contains
	contains	models'	several	status	information on	data source was	Medicare
	Medicare	performance. The	inclusion/exclusion	information. This	several	used to obtain	beneficiary
	beneficiary demographic,	number of measured entities	indicators such as Medicare status on	data source was used to obtain	inclusion/exclusio n indicators such	information on several	demographic, benefit/coverag
	benefit/coverag	and index	admission as well as	information on	as Medicare	inclusion/exclusi	e, and vital
	e, and vital	admissions are	vital status at	several	status on	on indicators	status
	status information.	listed below by specialty cohort.	discharge. These	inclusion/exclusi on indicators	admission as well as vital status.	such as Medicare status	information. This data source was
	This data	2. Medicare	data have previously been	such as	These data have	on admission as	used to obtain
	source was	Enrollment	shown to accurately	Medicare status	previously been	well as vital	information on
	used to obtain information on	Database (EDB):	reflect patient vital	on admission as well as vital	shown to accurately reflect	status. These data have	several inclusion/exclusi
	several	This database contains	status (Fleming et al., 1992).	status. These	patient vital	previously been	on indicators
		1	· · · · · ·		atatus / Flaming at	chown to	avala aa
	inclusion/exclus ion indicators	Medicare beneficiary	During original	data have previously been	status (Fleming et al., 1992).	shown to accurately	such as Medicare status

3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All- Procedure)	Readmission Measure (HWR)	(RSCR) following elective primary	standardized mortality rate	mortality rate (RSMR) following	Standardized Mortality Rate	standardized mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized Mortality		arthroplasty (THA) and/or total knee	following pneumonia	obstructive pulmonary	Following Coronary Artery	following acute myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
such as	demographic,	development we	shown to	hospitalization 3. The American	(CABG) Surgery reflect patient	hospitalization on admission as
Medicare	benefit/coverage,	validated the	accurately	Community	vital status	well as vital
status on admission as	and vital status information. This	administrative claims-based	reflect patient vital status	Survey (2008- 2012): The	(Fleming et al., 1992).	status. These data have
well as vital	data source was	definition of	(Fleming et al.,	American	The American	previously been
status. It was also used to	used to obtain information on	THA/TKA complication	1992). 3. The American	Community Survey data is	Community Survey (2008-	shown to accurately
determine	several	(original model	Community	collected annually	2012): The	reflect patient
hospice enrollment.	inclusion/exclusio n indicators such	specification) against a medical	Survey (2008- 2012): The	and an aggregated 5-	American Community	vital status (Fleming et al.,
No data	as Medicare	record data.	American	years data was	Survey data is	1992).
collection instrument	status on admission and	3. Data abstracted from medical	Community Survey data is	used to calculate the AHRQ SES	collected annually and an	3. Veterans Health
provided	following	records from eight	collected	composite index	aggregated 5-	Administration
Attachment Del18b1HOP5H	discharge from index admission	participating hospitals	annually and an aggregated 5-	score. 4. Data sources	years data was used to calculate	Data: This data source contains
WMClaimsData	ACR	(approximately 96	years data was	for the all-payer	the AHRQ	claims data for
Dictionary0107 2019.xlsx	1. Medicare Part A claims data for	records per hospital; 644 total	used to calculate the AHRQ SES	testing: For our analyses to	socioeconomic status (SES)	VA inpatient and outpatient
	calendar years	records) for	composite index	examine use in	composite index	services
	2013, 2014, and 2015.	Medicare beneficiaries over	score. 4. Data sources	all-payer data, we used all-payer	score. Data sources for	including: inpatient
	2013. 2. Medicare	the age of 65 years	for the all-payer	data from	the all-payer	hospital care,
	Enrollment Database (EDB).	who had a qualifying THA/TKA	update: For our analyses	California. California is a	testing: For our analyses to	outpatient hospital services,
	Reference:	procedure between	to examine use	diverse state,	examine use in	skilled nursing
	Fleming C., Fisher	January 1 2007 and December 31, 2008.	in all-payer data, we used all-	and, with more than 37 million	all-payer data, we used all-	facility care, some home
	ES, Chang CH, Bubolz D,	The measure was	payer data from	residents,	payer data from	health agency
	Malenda J.	also specified and testing using an all-	California in addition to CMS	California represents 12% of	California. California is a	services, as well as inpatient and
	Studying outcomes and	payer claims	data for	the US	diverse state,	outpatient
	hospital	dataset although it is only publically	Medicare FFS patients aged 65	population. We used the	and, with more than 37 million	physician claims for the 12
	utilization in the elderly: The	reported using the	years or over	California Patient	residents,	months prior to
	advantages of a	data sources listed above	(65+) in California	Discharge Data, a large, linked	California represents 12%	and including each index
	merged data base for Medicare and	4. California Patient	hospitals.	database of	of the US	admission. Unlike Medicare
	Veterans Affairs	Discharge Data is a large, linked	California is a diverse state,	patient hospital admissions. In	population. We used the	FFS patients, VA
	Hospitals. Medical Care.	database of patient	and, with more	2006, there were approximately 3	California Patient	patients are not required to have
	1992; 30(5): 377- 91.	hospital admissions in the state of	than 37 million residents,	million adult	Discharge Data,	been enrolled in
	Available in	California. Using all-	California	discharges from more than 450	a large linked database of	Part A and Part B Medicare for the
	attached	payer data from California, we	represents 12% of the US	non-Federal	patient hospital	12 months prior
	appendix at A.1 Attachment	performed analyses	population. We	acute care hospitals. Records	admissions. In 2006, there	to the date of admission.
	NQF_1789_NQF_	to determine whether the	used the California	are linked by a	were	All-payer data
	Data_Dictionary_ 05-26-	THA/TKA	Patient	unique patient identification	approximately 3 million adult	sources:
	17_v1.0.xlsx	complication measure can be	Discharge Data, a large, linked	number, allowing	discharges from	For our analyses to examine use
		applied to all adult patients, including	database of patient hospital	us to determine patient history	more than 450 non-Federal	in all-payer data, we used all-
		not only FFS	admissions. In	from previous	acute care	payer data from
		Medicare patients aged 65 years or	2009, there were 3,193,904	hospitalizations and to evaluate	hospitals. Records are	California in addition to CMS
		over, but also non-	adult discharges	rates of both	linked by a	data for
		FFS Medicare patients aged 18-64	from 446 non- Federal acute	readmission and mortality (via	unique patient identification	Medicare FFS 65+ patients in
		years at the time of	care hospitals.	linking with California vital	number, allowing us to	California
		admission. Additional Data	Records are linked by a	statistics records).	determine	hospitals. California is a
		source used for	unique patient	Using all-payer data from	patient history from previous	diverse state,
		analysis of the impact of SES	identification number,	California, we	hospitalizations	and, with more than 37 million
		variables on the	allowing us to	performed analyses to	and to evaluate rates of both	residents,
		measure's risk model. Note, the	determine patient history	determine	readmission and	California represents 12%
		variables derived	from previous	whether the COPD mortality	mortality (via linking with	of the US
		from these data are not included in the	hospitalizations and to evaluate	measure can be	California vital	population. We used the
		measure as	rates of both readmission and	applied to all adult patients,	statistics records).	California Patient
		specified 5. The American	mortality (via	including not only	Using all-payer	Discharge Data,
		Community Survey	linking with California vital	FFS Medicare patients aged 65	data from California, we	a large, linked database of
		(2009-2013): The American	statistics	or over, but also	performed	patient hospital
		Community Survey	records).	non-FFS Medicare patients aged 18-	analyses to determine	admissions. In 2006, there
		data is collected		patients agen 10-	uetennine	2000, 111010

3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure) Risk-	Measure (HWR)	elective primary total hip	mortality rate (RSMR)	(RSMR) following chronic	Mortality Rate (RSMR)	mortality rate (RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality Measure		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Weasure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
		annually and an	Using all-payer	64 years at the	whether the HF	were
		aggregated 5-years data was used to	data from California as well	time of admission.	readmission measure can be	approximately 3 million adult
		calculate the AHRQ	as CMS	Reference:	applied to all	discharges from
		socioeconomic	Medicare FFS	Fleming C., Fisher	adult patients,	more than 450
		status (SES) composite index	data for California	ES, Chang CH,	including not only FFS	non-Federal acute care
		score.	hospitals, we	Bubolz D, Malenda J.	Medicare	hospitals.
		Reference:	performed analyses to	Studying	patients aged 65 years or older,	Records are linked by a
		Fleming C., Fisher ES, Chang CH,	determine	outcomes and hospital	but also non-FFS	unique patient
		Bubolz D, Malenda	whether the	utilization in the	Medicare patients aged	identification number,
		J. Studying outcomes and	pneumonia mortality	elderly: The advantages of a	18-64 years at	allowing us to
		hospital utilization	measure can be	merged data base	the time of	determine
		in the elderly: The	applied to all adult patients,	for Medicare and	admission. Reference:	patient history from previous
		advantages of a merged data base	including not	Veterans Affairs Hospitals.	Fleming C.,	hospitalizations
		for Medicare and	only FFS	Medical Care.	Fisher ES, Chang	and to evaluate
		Veterans Affairs Hospitals. Medical	Medicare patients aged 65	1992; 30(5): 377- 91.	CH, Bubolz D, Malenda J.	rates of both readmission and
		Care. 1992; 30(5):	or over, but also	No data collection	Studying	mortality (via
		377-91.	non-FFS Medicare	instrument	outcomes and	linking with California vital
		Suter LG, Parzynski CS, Grady JN, et al.	patients aged	provided Attachment	hospital utilization in the	statistics
		2014 Procedure	18-64 years at the time of	NQF_1893_COPD	elderly: The	records).
		Specific Complication	admission.	_Mortality_NQF_	advantages of a merged data	Using all-payer data from
		Measure Updates	Reference:	Data_Dictionary_ v1.0 091818 kl.xl	base for	California as well
		and Specifications	Fleming C.,	sx	Medicare and Veterans Affairs	as CMS Medicare FFS
		Report: Elective Primary Total Hip	Fisher ES, Chang CH, Bubolz D,		Hospitals.	data for
		Arthroplasty (THA)	Malenda J.		Medical Care.	California
		and/or Total Knee Arthroplasty (TKA)	Studying outcomes and		1992; 30(5): 377-91.	hospitals, we performed
		Risk-Standardized	hospital		No data	analyses to
		Complication	utilization in the		collection	determine whether the AMI
		Measure (Version 3.0). 2014	elderly: The advantages of a		instrument provided	mortality
		No data collection	merged data		Attachment	measure can be applied to all
		instrument	base for Medicare and		NQF_2558_CAB G_Mortality_Dat	adult patients,
		provided Attachment	Veterans Affairs		a_Dictionary_12	including not
		NQF_1550_HipKnee	Hospitals. Medical Care.		-30-16_v1.0.xlsx	only FFS Medicare
		_Complication_Data _Dictionary_v1.0.xls	1992; 30(5):			patients aged
		X	377-91.			65+ but also non-FFS
			No data collection			Medicare
			instrument			patients aged 65+ and younger
			provided Attachment			patients aged
			NQF_0468_Pneu			18-64 years at
			monia_Mortality			the time of admission.
			_Data_Dictionar y_09-26-			References:
			17_v1.0.xls			Fleming C, Fisher
						ES, Chang CH, Bubolz TA,
						Malenka DJ.
						Studying outcomes and
						hospital
						utilization in the
						elderly: The advantages of a
						merged data
						base for Medicare and
						Veterans Affairs
						hospitals.
						Medical Care. 1992; 30(5):
						377-91.
						No data
						collection instrument
						provided
						Attachment
						NQF_0230_AMI

	3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
	Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	Unplanned Readmission Measure (HWR)	complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
							_Mortality_Data _Dictionary_Fina l- 6369733006437 62106.xlsx
Level	Facility	Facility, Integrated Delivery System	Facility	Facility	Facility	Facility	Facility
Setting	Inpatient/Hospi tal	Inpatient/Hospita I, Outpatient Services	Inpatient/Hospital	Inpatient/Hospit al	Inpatient/Hospita I	Inpatient/Hospit al	Inpatient/Hospit al
Numerator Statement	The outcome for this measure is 30- day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.	Services The outcome for the HWR measure is 30-day readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions, within 30 days from the date of discharge from an eligible index admission. If a patient has more than one unplanned admission (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. The measure looks for a dichotomous yes or no outcome of whether each admitted patient has an unplanned readmission within 30 days. However, if the first readmission after discharge is considered planned, any subsequent unplanned readmission is not counted as an outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned, any subsequent unplanned readmission could be related to care provided during the intervening planned, any subsequent unplanned readmission could be related to care provided during the intervening planned readmission could be actor coutome is defined identically to what is described	The outcome for this measure is any complication occurring during the index admission (not coded present on arrival) to 90 days post-date of the index admission. Complications are counted in the measure only if they occur during the index hospital admission or during a readmission. The complication outcome is a dichotomous (yes/no) outcome. If a patient experiences one or more of these complications in the applicable time period, the complication outcome for that patient is counted in the measure as a "yes".	The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary discharge diagnosis of severe sepsis. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with either a principal discharge diagnosis of COPD or a principal discharge diagnosis of acute exacerbation of COPD. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30-day all-cause mortality. Mortality is defined as death for any reason within 30 days of the procedure date from the index admission for patients 18 and older discharged from the hospital after undergoing isolated CABG surgery.	The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days from the date of admission for patients discharged from the hospital with a principal diagnosis of AMI. Additional details are provided in S.5 Numerator Details.

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital- Wide (All-	Wide All-Cause Unplanned	risk-standardized complication rate	30-day, all- cause, risk-	Day, all-cause, risk-standardized	30-Day, All- Cause, Risk-	30-day, all- cause, risk-
	Condition, All- Procedure)	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
	Risk-	Measure (HWR)	elective primary total hip	mortality rate (RSMR)	(RSMR) following chronic	Mortality Rate (RSMR)	mortality rate (RSMR)
	Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
	Mortality Measure		and/or total knee arthroplasty (TKA)	pneumonia hospitalization	pulmonary disease (COPD)	Coronary Artery Bypass Graft	myocardial infarction (AMI)
	Wicusure		arthropiasty (TKA)	nospitalization	hospitalization	(CABG) Surgery	hospitalization
		above for the HWR measure.					
Numerator Details	The measure outcome is	The measure counts	The composite complication is a	Outcome definition	Outcome definition	In the current publicly	Outcome definition
Details	death from any	readmissions to	dichotomous	This measure	This measure	reported	This measure
	cause within 30	any acute care	outcome (yes for	counts death	counts death	measure, we	counts death
	days of the admission date	hospital for any cause within 30	any complication(s); no for no	from any cause within 30 days of	from any cause within 30 days of	identify deaths for Medicare FFS	from any cause within 30 days
	of the index	days of the date	complications).	the index	the index	patients 65	after the index
	admission, for Medicare FFS	of discharge of the index	Therefore, if a patient experiences	admission date.	admission date.	years or older in the Medicare	admission date.
	patients	admission,	one or more	Rationale: From a patient	Rationale: From a patient	Enrollment	Rationale: From a patient
	identified using the Medicare	excluding planned readmissions as	complications, the outcome variable	perspective,	perspective,	Database (EDB).	perspective,
	Enrollment	defined below.	will get coded as a	death is the most critical	death is the most critical outcome	Outcome Attribution:	death is the most critical
	Database	Planned	"yes".	outcome	regardless of	Attribution of	outcome
	(EDB). The numerator is a	Readmission Algorithm	Complications are counted in the	regardless of	cause. Outcomes	the outcome in	regardless of
	binary variable	(Version 4.0)	measure only if they	cause. Outcomes	occurring within 30 days of	situations where a patient has	cause. Outcomes
	(1=yes/0=no) that indicates	The Planned	occur during the index hospital	occurring within	admission can be	multiple	occurring within
	whether the	Readmission Algorithm is a set	admission (and are	30 days of admission can	influenced by hospital care and	contiguous admissions, at	30 days of admission can
	patient died within 30 days	of criteria for	not present on admission) or	be influenced by	appropriate	least one of	be influenced by
	of the index	classifying readmissions as	during a	hospital care and early	transition to the non-acute care	which involves a qualifying	hospital care and early
	admission date.	planned among	readmission.	transition to the	setting. The 30-	isolated CABG	transition to the
		the general	The complications captured in the	non-acute care	day time frame is	procedure is as	non-acute care
		Medicare population using	numerator are	setting. The 30- day time frame	a clinically meaningful	follows: 1) If a patient	setting. The 30- day time frame
		Medicare	identified during	is a clinically	period for	undergoes a	is a clinically
		administrative claims data. The	the index admission OR associated with	meaningful period for	hospitals to collaborate with	CABG procedure in the first	meaningful period for
		algorithm	a readmission up to	hospitals to	their	hospital and is	hospitals to
		identifies admissions that	90 days post-date of index admission,	collaborate with their	communities to reduce mortality	then transferred	collaborate with their
		are typically	depending on the	communities to	(Simoes et al.,	to a second hospital where	communities to
		planned and may occur within 30	complication. The follow-up period for	reduce mortality (Simoes et al.,	2018; Dharmarajan et	there is no CABG	reduce mortality.
		days of discharge	complications from	2017;	al., 2015).	procedure, the mortality	(Simoes et al.,
		from the hospital.	date of index admission is as	Dharmarajan et	Identifying deaths	outcome is	2018;
		The Planned Readmission	follows:	al., 2015). Identifying	in the Medicare FFS population	attributed to the first hospital	Dharmarajan et al., 2015).
		Algorithm has	The follow-up	deaths in the	As currently	performing the	Identifying
		three fundamental	period for AMI, pneumonia, and	Medicare FFS population	reported, we	index CABG procedure and	deaths in the Medicare FFS
		principles:	sepsis/septicemia/s	As currently	identify deaths for FFS Medicare	the 30-day	population
		1. A few specific,	hock is seven days from the date of	reported, we	patients 65 years	window starts	As currently
		limited types of care are always	index admission	identify deaths for FFS Medicare	and older in the Medicare	with the date of index CABG	reported, we identify deaths
		considered	because these	patients 65	Enrollment	procedure.	for FFS Medicare
		planned (obstetric	conditions are more likely to be	years and older in the Medicare	Database (EDB).	Rationale: A transfer	patients 65 years and older
		delivery,	attributable to the	Enrollment	Reference: 1. Simoes J, Grady	following CABG	in the Medicare
		transplant	procedure if they occur within the	Database (EDB).	J, Purvis D, et al.	is most likely	Enrollment
		surgery, maintenance	first week after the	Identifying deaths in the all-	2018 Condition- Specific Measures	due to a complication of	Database (EDB). Identifying
		chemotherapy/im	procedure. Additionally,	payer	Updates and	the index	deaths in the all-
		munotherapy, rehabilitation);	analyses indicated a	population	Specifications	procedure and that care	payer population
		2. Otherwise, a	sharp decrease in the rate of these	For the purposes of development	Report Hospital- Level 30-Day Risk-	provided by the	For the purposes
		planned	the rate of these complications after	of an all-payer	Standardized	hospital performing the	of development
		readmission is defined as a non-	seven days.	measure, deaths were identified	Mortality Measures.	CABG procedure	of an all-payer measure, deaths
		acute	Death, surgical site bleeding, and	using the	http://www.quali	likely dominates	were identified
		readmission for a scheduled	pulmonary	California vital statistics data	tynet.org/dcs/Co ntentServer?c=Pa	mortality risk even among	using the California vital
		procedure; and	embolism are	file. Nationally,	ge&pagename=Q	transferred	statistics data
		3. Admissions for	followed for 30 days following admission	post-discharge	netPublic/Page/Q	patients.	file. Nationally,
		acute illness or for complications	because clinical	deaths can be identified using	netTier3&cid=116 3010421830.	<ol><li>If a patient is admitted to a</li></ol>	post-discharge deaths can be
		of care are never	experts agree these complications are	an external	Accessed June 6,	first hospital but	identified using
		planned.	still likely	source of vital	2018.	does not receive a CABG	an external
		The algorithm was developed in	attributable to the	status, such as the Social	2. Dharmarajan K, Hsieh AF, Kulkarni	procedure there	source of vital status, such as
		2011 as part of	hospital performing the procedure	Security	VT, et al. 2015	and is then	the Social
		the Hospital-Wide Readmission	during this period	Administration's Death Master	Trajectories of	transferred to a second hospital	Security Administration's
		measure. In 2013,	and rates for these complications	File (DMF) or the	risk after hospitalization for	where a CABG is	Death Master
		CMS applied the	remained elevated	Centers for Disease Control	heart failure,	•	File (DMF) or the
			•	Centers for Disease Control	-	performed, the mortality	File (DMF) o Centers for

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	Wide All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
		algorithm to its other readmission Algorithm and associated code tables are attached in data field S.2b (Data Dictionary or Code Table).	until roughly 30 days post admission. The measure follow-up period is 90 days after admission for mechanical complications and periprosthetic joint infection/wound infection. Experts agree that mechanical complications and periprosthetic joint infection/wound infections due to the index THA/TKA occur up to 90 days following THA/TKA. The measure counts all complications occurring during the index admission regardless of when they occur. For example, if a patient experiences an AMI on day 10 of the index admission, the measure will count the AMI as a complication, although the specified follow-up period for AMI is seven days. Clinical experts agree with this approach, as such complications likely represent the quality of care provided during the index admission. As of 2014 reporting, the measure does not count complications likely represent the quality of care provided during the index admission. As of 2014 reporting, the measure does not count complications likely represent on admission for the THA/TKA procedure. For full list of ICD-9 and ICD-10 codes during the index admission; this prevents identifying a condition as a complication of care if it was present on admission for the THA/TKA procedure. For full list of ICD-9 and ICD-10 codes defining complications for the THA/TKA procedure. For full list of ICD-9 and ICD-10 codes defining complication for the THA/TKA procedure. For full list of ICD-9 and ICD-10 codes defining complication for the THA/TKA procedure. For full codes ICD9-ICD10".	and Prevention's National Death Index (NDI). References: 1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition- Specific Measures Updates and Specifications Report Hospital- Level 30-Day Risk- Standardized Mortality Measures. http://www.qual itynet.org/dcs/C ontentServer?c= Page&pagename =QnetPublic/Pag e/QnetTier3&cid =116301042183 0. Accessed June 7, 2017. 2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical research ed);350:h411	acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350: h411	outcome is attributed to the second hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure. Rationale: Care provided by the hospital performing the CABG procedure likely dominates mortality risk. 3) If a patient undergoes a CABG procedure in the first hospital and is transferred to a second hospital where another CABG procedure is performed, the mortality outcome is attributed to the first hospital performing the index (first) CABG procedure and the 30-day window starts with the date of index CABG procedure. Rationale: A transfer following CABG is most likely due to a complication of the index procedure, and care provided by the hospital performing the index CABG procedure likely dominates mortality risk even among transferred patients.	Disease Control and Prevention's National Death Index (NDI). Reference: 1. Simoes J, Grady J, Purvis D, et al. 2018 Condition- Specific Measures Updates and Specifications Report Hospital- Level 30-Day Risk- Standardized Mortality Measures. http://www.qual itynet.org/dcs/C ontentServer?c= Page&pagename =QnetPublic/Pag e/QnetTier3&cid =116301042183 O. Accessed May 4, 2018.
Denominat or Statement	The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between	The measure at the hospital level includes admissions for Medicare beneficiaries who are 65 years and older and are discharged from	The target population for the publically reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing	This claims- based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or	This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older.	This claims- based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or	This claims- based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or

	3504 Claims- Only Hospital- Wide (All-	1789 Hospital- Wide All-Cause Unplanned	1550 Hospital-level risk-standardized complication rate	0468 Hospital 30-day, all- cause, risk-	1893 Hospital 30- Day, all-cause, risk-standardized	2558 Hospital 30-Day, All- Cause, Risk-	0230 Hospital 30-day, all- cause, risk-
	Condition, All- Procedure) Risk- Standardized Mortality Measure	Readmission Measure (HWR)	(RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	standardized mortality rate (RSMR) following pneumonia hospitalization	mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
Denominat	65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.	all non-federal, acute care inpatient US hospitals (including territories) with a complete claims history for the 12 months prior to admission. The measure at the ACO level includes all relevant admissions for ACO assigned beneficiaries who are 65 and older and are discharged from all non-Federal short-stay acute care hospitals, including critical access hospitals. Additional details are provided in S.9 Denominator Details.	elective primary THA and/or TKA procedures. Additional details are provided in S.9 Denominator Details.	older. We have tested the measure in both age groups. The cohort includes admissions for patients aged 18 years and older discharged from the hospital with a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia (including discharge diagnosis of severe sepsis coded as POA, and no secondary diagnosis of severe sepsis coded as POA, and no secondary diagnosis of severe sepsis coded as POA, and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non- federal acute care hospitals. Additional details are provided in S.7 Dentails. To be included	NospitalizationWe have tested the measure in both age groups.The cohort includes admissions for patients discharged from the hospital with either a principal discharge diagnosis of COPD, or a principal discharge diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD; and with a complete claims history for the 12 months prior to admission.The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non- federal hospitalsAdditional details are provided in S.7 Denominator Details.	CABG) Surgery older. We have tested the measure in both age groups. The cohort includes admissions for patients who receive a qualifying isolated CABG procedure (see the attached Data Dictionary) and with a complete claims history for the 12 months prior to admission. CMS publicly reports this measure for those patients 65 years or older who are Medicare FFS beneficiaries admitted to non- federal hospitals. If a patient has more than one qualifying isolated CABG admission in a year, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.	Itespitalizationolder. We have tested the measure in both age groups.The cohort includes admissions for patients discharged from the hospital with a principal discharge diagnosis of AMI and with a complete claims history for the 12 months prior to admission.The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non- federal hospitals or patients admitted to VA hospitals.Additional details are provided in S.7 Denominator Details.
or Details	admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients: 1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission	the hospital level measure, cohort patients must be: 1. Enrolled in Medicare fee-for- service (FFS) Part A for the 12 months prior to the date of admission and during the index admission; 2. Aged 65 or over; 3. Discharged alive from a non- federal short- term acute care hospital; and	the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Enrolled in Medicare fee-for- service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission; 2. Aged 65 or older 3. Having a qualifying elective primary THA/TKA	in the measure cohort used in public reporting, patients must meet the following inclusion criteria: 1. Have a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or sepsis (not including severe sepsis) with a secondary	the measure cohort used in public reporting, patients must meet the following inclusion criteria: 1. Have principal discharge diagnosis of COPD or principal discharge diagnosis of respiratory failure with a secondary diagnosis of COPD with exacerbation;	included index admissions for patients: 1. Having a qualifying isolated CABG surgery during the index admission; 2. Enrolled in Medicare fee- for-service (FFS) Part A and Part B for the 12 months prior to the date of the index admission, and enrolled in Part A during the	in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Having a principal discharge diagnosis of AMI; 2. Enrolled in Medicare FFS Part A and Part B for the first 12 months prior to the date of

3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment. 2. Not transferred from another acute care facility Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization is included as the hospitalization to which the mortality outcome is attributed (the index admission). 3. Aged between 65 and 94 years Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients younger than 65 are not included to avoid holding hospitalis responsible for the survival of the very elderly patients, who	4. Not transferred to another acute care facility. The ACO version of this measure has the additional criterion that only hospitalizations for ACO-assigned beneficiaries that meet all of the other criteria listed above are included. The cohort definition is otherwise identical to that of the HWR described below. The measure aggregates the ICD-9 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure (condition categories) using the AHRQ CCS. There are a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure categories. Using at e aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure categories. Using the AHRQ CS procedure categories. Using the AHRQ CS proc	procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following: • Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission • Partial hip arthroplasty (PHA) procedures (with a concurrent THA/TKA); partial knee arthroplasty procedures are not distinguished by ICD9 codes and are currently captured by the THA/TKA measure • Revision procedures with a concurrent THA/TKA • Resurfacing procedures with a concurrent THA/TKA • Resurfacing procedures with a concurrent THA/TKA • Mechanical complication coded in the principal discharge • Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field • Removal of implanted devises/prostheses • Transfer status from another acute care facility for the THA/TKA Patients are eligible for inclusion in the denominator if they had an elective primary THA and/or a TKA AND had continuous enrollment in Part A and Part B Medicare fee-for-service (FFS) 12 months prior to the date of index admission. This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ yeage ad5+ years (see	diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA; 2. Enrolled in Medicare fee- for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission; 3. Aged 65 or over; and 4. Not transferred from another acute care facility ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.	<ol> <li>Enrolled in Medicare fee- for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission, beneficiaries;</li> <li>Aged 65 or over; and</li> <li>Not transferred from another acute care facility.</li> <li>ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.</li> </ol>	index admission; and, 3. Aged 65 or over. Isolated CABG surgeries are defined as those CABG procedures performed without the following concomitant valve or other major cardiac, vascular, or thoracic procedures: o Valve procedures; o Atrial and/or ventricular septal defects; o Congenital anomalies; o Other open cardiac procedures; o Heart transplants; o Aorta or other non-cardiac arterial bypass procedures; o Head, neck, intracranial vascular procedures; o Head, neck, intracranial vascular procedures; o Head, neck, intracranial vascular procedures; o Head, neck, intracranial vascular procedures; o Head, neck international Classification of Diseases, 9th Revision, Clinical Modification (ICD-9) codes as well as International Classification of Disease, 10th Revision (ICD-10) codes used to define the cohort are listed in the attached Data Dictionary.	admission, enrolled in Part A during the index admission, or those who are VA beneficiaries; 3. Aged 65 or over; and 4. Not transferred from another acute care facility. ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital- Wide (All-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
	Condition, All-	Unplanned Readmission	complication rate (RSCR) following	cause, risk- standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
	Procedure) Risk-	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
	Standardized		total hip arthroplasty (THA)	(RSMR) following	chronic obstructive	(RSMR) Following	(RSMR) following acute
	Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
	Measure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
	may be less	expected to	Section 2b4.11 of				
	likely to have survival as a	experience similar added (or	the Testing Attachment for				
	primary goal.	reduced) levels of	details, 2b4.11).				
	Note that the hybrid measure	readmission risk. The measure first	International Classification of				
	(submitted for	assigns	Diseases, 9th				
	NQF endorsement in	admissions with qualifying AHRQ	Revision, Clinical Modification (ICD-9-				
	parallel with	procedure	CM) codes used to				
	the claims-only measure)	categories to the Surgery/Gynecolo	define the cohort for each measure				
	differs from the	gy Cohort. This	are:				
	claims-only measure in	cohort includes admissions likely	ICD-9-CM codes used to define a				
	terms of the	cared for by	THA or TKA:				
	age range of included	surgical or gynecological	81.51 Total Hip Replacement				
	admissions; the	teams.	Replacement 81.54 Total Knee				
	hybrid measure includes all	The measure then sorts admissions	Replacement				
	inpatient	into one of the	ICD-10 Codes that define a THA or				
	admissions for patients aged	four remaining specialty cohorts	TKA:				
	50-94 years old.	based on the	OSR90J9 Replacement of				
	The intention is to fully	AHRQ diagnosis category of the	Right Hip Joint with				
	harmonize the	principal	Synthetic Substitute,				
	cohort definitions for	discharge diagnosis:	Cemented, Open				
	the two measures, so	The	Approach 0SR90JA				
	that both	Cardiorespiratory Cohort includes	Replacement of				
	measures will capture	several condition	Right Hip Joint with Synthetic				
	admissions for	categories with very high	Substitute,				
	patients age 65-94. We	readmission rates	Uncemented, Open Approach				
	deviated from	such as pneumonia,	OSR90JZ				
	that definition during	chronic	Replacement of				
	development	obstructive pulmonary	Right Hip Joint with Synthetic				
	and testing for the hybrid	disease, and	Substitute, Open Approach				
	measure due to	heart failure. These admissions	OSRB0J9				
	the limited dataset	are combined	Replacement of Left				
	available that	into a single cohort because	Hip Joint with Synthetic				
	included the EHR data	they are often	Substitute,				
	elements	clinically indistinguishable	Cemented, Open Approach				
	needed to calculate the	and patients are often	OSRBOJA				
	hybrid	simultaneously	Replacement of Left Hip Joint with				
	measure. Note that the risk	treated for several of these	Synthetic				
	model already	diagnoses.	Substitute, Uncemented, Open				
	includes age in years, as a risk	The Cardiovascular	Approach				
	variable.)	Cohort includes	OSRBOJZReplaceme nt of Left Hip Joint				
	4. Not admitted for primary	condition categories such as	with Synthetic				
	psychiatric	acute myocardial	Substitute, Open Approach				
	diagnoses Rationale:	infarction that in large hospitals	0SRC07Z				
	Patients	might be cared	Replacement of Right Knee Joint				
	admitted for psychiatric	for by a separate cardiac or	with Autologous				
	treatment are	cardiovascular	Tissue Substitute, Open Approach				
	typically cared for in separate	team. The Neurology	0SRC0JZReplaceme				
	psychiatric	Cohort includes	nt of Right Knee Joint with Synthetic				
	facilities that are not	neurologic condition	Substitute, Open				
	comparable to	categories such as	Approach OSRCOKZ				
	short-term acute care	stroke that in large hospitals	Replacement of				
	hospitals (see	might be cared	Right Knee Joint with Nonautologous				
	data dictionary, HWM Non-	for by a separate neurology team.					
L	1	near orogy team.		1	1	1	1

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All- Procedure)	Readmission Measure (HWR)	(RSCR) following elective primary	standardized mortality rate	mortality rate (RSMR) following	Standardized Mortality Rate	standardized mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality Measure		and/or total knee arthroplasty (TKA)	pneumonia hospitalization	pulmonary disease (COPD)	Coronary Artery Bypass Graft	myocardial infarction (AMI)
			nospitalization	hospitalization	(CABG) Surgery	hospitalization
Acute Care	The Medicine	Tissue Substitute,				
Inclusion tab).	Cohort includes all non-surgical	Open Approach 0SRD07Z				
5. Not admitted for	patients who	Replacement of Left				
rehabilitation	were not	Knee Joint with				
Rationale:	assigned to any of the other cohorts.	Autologous Tissue				
These admissions are	The full list of the	Substitute, Open Approach				
not typically to	specific diagnosis	OSRDOJZ				
a short-term	and procedure	Replacement of Left				
acute care hospital and	AHRQ CCS categories used	Knee Joint with Synthetic				
are not for	to define the	Substitute, Open				
acute care (see	specialty cohorts	Approach				
data dictionary, HWM Non-	are attached in data field S.2b	0SRD0KZReplaceme nt of Left Knee Joint				
Acute Care	(Data Dictionary	with Nonautologous				
Inclusion tab).	or Code Table).	Tissue Substitute,				
6. Not enrolled in hospice at		Open Approach				
the time of, or		OSRT07Z Replacement of				
12 months		Right Knee Joint,				
prior to, their index		Femoral Surface with Autologous				
admission		Tissue Substitute,				
Rationale:		Open Approach				
Patients enrolled in		OSRTOJZ Replacement of				
hospice in the		Right Knee Joint,				
prior 12		Femoral Surface				
months or at the time of		with Synthetic Substitute, Open				
admission are		Approach				
unlikely to have 30-day survival		OSRTOKZ				
as a primary		Replacement of Right Knee Joint,				
goal.		Femoral Surface				
7. Not enrolled		with Nonautologous				
in hospice within two days		Tissue Substitute, Open Approach				
of admission		OSRU07Z				
Rationale:		Replacement of Left				
There is not a single, correct		Knee Joint, Femoral Surface with				
approach		Autologous Tissue				
regarding patients		Substitute, Open				
enrolled in		Approach OSRUOJZ				
hospice during		Replacement of Left				
admission or upon discharge		Knee Joint, Femoral				
– mortality may		Surface with Synthetic				
or may not		Substitute, Open				
represent a quality signal		Approach				
for this group		0SRU0KZ Replacement of Left				
of patients and hospice		Knee Joint, Femoral				
enrollment is		Surface with				
inadequate to		Nonautologous Tissue Substitute,				
differentiate this issue.		Open Approach				
However, for		OSRV07Z				
most patients		Replacement of Right Knee Joint,				
and/or families who had the		Tibial Surface with				
discussion and		Autologous Tissue				
agreed to enroll in hospice		Substitute, Open Approach				
within two days		OSRVOJZ				
of admission,		Replacement of				
30-day survival is not likely the		Right Knee Joint, Tibial Surface with				
primary goal		Synthetic				
due to their		Substitute, Open Approach				
condition and not the quality		OSRVOKZ				
of care		Replacement of				
received.		Right Knee Joint, Tibial Surface with				
 		TIDIAL SUITACE WITH				

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All- Condition, All-	Unplanned Readmission	complication rate (RSCR) following	cause, risk- standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
Procedure) Risk-	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Standardized		total hip arthroplasty (THA)	(RSMR) following	chronic obstructive	(RSMR) Following	(RSMR) following acute
Mortality Measure		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
8. Not with a		Nonautologous				
principal diagnosis of		Tissue Substitute, Open Approach				
cancer and		OSRW07Z				
enrolled in hospice during		Replacement of Left Knee Joint, Tibial				
their index		Surface with				
admission		Autologous Tissue				
Rationale: Patients		Substitute, Open Approach				
admitted		OSRWOJZ				
primarily for cancer who are		Replacement of Left Knee Joint, Tibial				
enrolled in		Surface with				
hospice during admission are		Synthetic Substitute, Open				
unlikely to have		Approach				
30-day survival as a primary		OSRWOKZ Replacement of Left				
goal of care.		Knee Joint, Tibial				
(see data dictionary,		Surface with Nonautologous				
HWM Cancer		Tissue Substitute,				
Inclusion tab). 9. Without any		Open Approach An ICD-9 to ICD-10				
diagnosis of		crosswalk is				
metastatic cancer		attached in field				
Rationale:		S.2b. (Data Dictionary or Code				
Although some patients		Table).				
admitted with a		Elective primary THA/TKA				
diagnosis of metastatic		procedures are				
cancer will		defined as those procedures without				
have 30-day survival as a		any of the				
primary goal of		following: 1) Femur, hip, or				
care, for many such patients		pelvic fractures				
admitted to the		coded in principal or secondary				
hospital, death may be a		discharge diagnosis				
clinically		fields of the index admission				
reasonable and patient-		2) Partial hip				
centered		arthroplasty (PHA) procedures with a				
outcome. (see data dictionary,		concurrent				
HWM		THA/TKA				
Metastatic Cancer		3) Revision procedures with a				
Inclusion tab).		concurrent				
10. Not with a principal		THA/TKA 4) Resurfacing				
discharge		procedures with a				
diagnosis, or a secondary		concurrent THA/TKA				
diagnosis that		5) Mechanical				
is present on admission		complication coded in the principal				
(POA) for a		discharge				
condition which hospitals have		6) Malignant neoplasm of the				
limited ability		pelvis, sacrum,				
to influence survival		coccyx, lower limbs, or bone/bone				
Rationale:		marrow or a				
Hospitals have little ability to		disseminated malignant neoplasm				
impact		coded in the				
mortality for some		principal discharge diagnosis field				
conditions. This		7) Removal of				
list of		implanted				
conditions (see data dictionary,		devises/prostheses 8) Transfer status				
HWM ICD-10		from another acute				
Inclusion tab) was		care facility for the THA/TKA				

3504 Claims-	1790 Hospital	1FF0 Upenital loval	0468 Hospital	1902 Hospital 20		0230 Hospital
Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All- Procedure)	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Risk-	Measure (HWR)	elective primary total hip	mortality rate (RSMR)	(RSMR) following chronic	Mortality Rate (RSMR)	mortality rate (RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
determined		For a full list of ICD-		nospitalization		nospitalization
through		9 and ICD-10 codes				
independent review, by		defining the				
several		following see attached Data				
clinicians, of		Dictionary, sheet				
conditions associated with		"THA TKA Cohort				
high mortality.		Codes Part 2."				
The decisions						
were also reviewed with						
our Technical						
Expert Panel						
(TEP) and Technical Work						
Group.						
Admissions are not included in						
the cohort if						
the patient had						
a principal diagnosis code						
that is on this						
list, or a						
secondary code with POA that						
is on the list.						
In addition, for						
patients with multiple						
admissions, the						
measure						
selects only one admission,						
at random, for						
inclusion. There is no practical						
statistical						
modeling						
approach that can account or						
adjust for the						
complex						
relationship between the						
number of						
admissions and risk of mortality						
in the context						
of a hospital-						
wide mortality measure.						
Random						
selection ensures that						
providers are						
not penalized						
for a "last" admission						
during the						
measurement						
period; selecting the						
last admission						
would not be as accurate a						
reflection of						
the risk of						
death as random						
selection, as						
the last						
admission is inherently						
associated with						
a higher						
mortality risk. Random						
selection is also						
used in CMS's						

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All- Condition, All-	Unplanned Readmission	complication rate (RSCR) following	cause, risk- standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized Mortality		arthroplasty (THA) and/or total knee	following pneumonia	obstructive pulmonary	Following Coronary Artery	following acute myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
and the				hospitalization	(CABG) Surgery	hospitalization
condition- specific						
mortality						
measures. Note that random						
selection						
reduces the number of						
admissions, but						
does not						
exclude any patients from						
the measure.						
The cohort is defined using						
ICD-10 Clinical						
Modification						
codes identified in Medicare						
Part A Inpatient						
claims data. The measure						
aggregates the						
ICD-10 principal diagnosis and						
all procedure						
codes of the						
index admission into						
clinically						
coherent groups of						
conditions and						
procedures (condition						
categories or						
procedure categories)						
using the						
Agency for Healthcare						
Research and						
Quality (AHRQ)						
Clinical Classifications						
System (CCS).						
There is a total of 285 mutually						
exclusive AHRQ						
condition categories,						
most of which						
are single, homogenous						
diseases such						
as pneumonia						
or acute myocardial						
infarction.						
Some are aggregates of						
conditions,						
such as "other bacterial						
infections".						
There is a total of 231 mutually						
exclusive						
procedure categories.						
Using the AHRQ						
CCS procedure and condition						
categories, the						
measure						
assigns each index						
hospitalization						
to one of 15 mutually						
exclusive						

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All- Condition, All-	Unplanned Readmission	complication rate (RSCR) following	cause, risk- standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk- Standardized		total hip arthroplasty (THA)	(RSMR) following	chronic obstructive	(RSMR) Following	(RSMR) following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
divisions. The						
divisions were created based						
upon clinical						
coherence,						
consistency of mortality risk,						
adequate						
patient and hospital case						
volume for						
stable results reporting, and						
input from						
clinicians, patients, and						
patient						
caregivers on usability.						
The measure						
first assigns						
admissions with qualifying						
AHRQ						
procedure categories to						
one of six						
surgery divisions by						
identifying a						
defining surgical						
procedure. The						
defining surgical						
procedure is						
identified using the following						
algorithm: 1) if						
a patient only has one major						
surgical						
procedure then that procedure						
is the defining						
surgical procedure; 2) if						
a patient has						
more than one major surgical						
procedure, the						
first dated procedure						
performed						
during the index						
admission is						
the defining surgical						
procedure; 3) if						
there is more than one major						
surgical						
procedure on that earliest						
date, the						
procedure with						
the highest mortality rate is						
the defining						
surgical procedure.						
These divisions						
include admissions						
likely cared for						
by surgical teams.						
The surgical						
divisions are:						
 Surgical Cancer						

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	Wide All-Cause Unplanned Readmission Measure (HWR)	risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
	(see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures. For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel. The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal divisions based on the AHRQ diagnostic TCS of the principal divisions are: Cancer, Cardiac, Gastrointestinal , Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions. The full list of the specific diagnosis and procedure AHRQ CCS cato gerine used to dvisions are attached in the Data Dictionary.						
Exclusions	The measure excludes index admissions for patients: 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;	The measure excludes index admissions for patients: 1. Admitted to Prospective Payment System (PPS)-exempt cancer hospitals; 2. Without at least 30 days post-discharge	This measure excludes index admissions for patients: 1. Without at least 90 days post- discharge enrollment in FFS Medicare; 2. Who were discharged against medical advice (AMA); or,	This mortality measure excludes index admissions for patients: 1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;	The mortality measure excludes index admissions for patients: 1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; 2. Enrolled in the Medicare	The CABG surgery mortality measure excludes index admissions for patients: 1. With inconsistent or unknown vital status or other unreliable demographic	The mortality measure excludes index hospitalizations that meet any of the following exclusion criteria: 1. Discharged alive on the day of admission or the following day who were

	3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
	2. Discharged against medical advice (AMA); 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trun k (CCS 235), and burns (CCS 240); and 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.	enrollment in FFS Medicare; 3. Discharged against medical advice (AMA); 4. Admitted for primary psychiatric diagnoses; 5. Admitted for medical treatment of cancer.	3. Who had more than two THA/TKA procedure codes during the index hospitalization. After applying these exclusion criteria, we randomly select one index admission for patients with multiple index admissions in a calendar year. We therefore exclude the other eligible index admissions in that year.	<ol> <li>With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;</li> <li>Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or,</li> <li>Discharged against medical advice.</li> <li>For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Similarly, for the three- year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure includes only the June admission.</li> </ol>	hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or 3. Discharg ed against medical advice For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded. Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admissions are excluded to avoid assigning a single death to two admissions.	(age and gender) data; or, 2. Discharged against medical advice (AMA). For patients with more than one qualifying CABG surgery admission in the measurement period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.	not transferred to another acute care facility; 2. Inconsistent or unknown vital status or other unreliable demographic (age and gender) data; 3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission, or 4. Discharged against medical advice (AMA). For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Similarly, for the three- year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the cohort. Similarly, for the three- year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure reporting periods (June and and year) and both are randomly selected for inclusion in the measure reporting periods (June and and and and and and and and and and
Exclusion Details	1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data Rationale: The measure does not include stays for patients where the admission date is after the date of death in	<ol> <li>Admitted to a PPS-exempt cancer hospital, identified by the Medicare provider ID.</li> <li>Admissions without at least 30 days post- discharge enrollment in FFS Medicare are determined using data captured in the Medicare</li> </ol>	This measure excludes index admissions for patients: 1. Without at least 90 days post- discharge enrollment in FFS Medicare Rationale: The 90- day complication outcome cannot be assessed in this group since claims data are used to determine whether	1. Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years; 2) if the discharge date for a hospitalization is before the admission date;	1. Inconsist ent vital status or unreliable demographic data in the claims Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is	The CABG surgery mortality measure excludes index admissions for patients: 1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data.	<ol> <li>Discharged alive on the day of admission or the following day who were not transferred to another acute care facility.</li> <li>Discharges are identified using data from the claims.</li> <li>Rationale: It is unlikely that these patients</li> </ol>

3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data. 2. Discharged against medical advice (AMA) Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trun k (CCS 235), and burns (CCS 240) Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions. These conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals. 4. With a principal discharge diagnosis within a CCS with fewer than 100 admisions in that ithe measurement year.	Enrollment Database (EDB). 3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in claims data. 4. Admitted for primary psychiatric disease, identified by a principal diagnosis in one of the specific AHRQ CCS categories listed in the attached data dictionary. 5. Admitted for rehabilitation care, identified by the specific ICD-9 diagnosis codes included in CCS 254 (Rehabilitation care; fitting of prostheses; and adjustment of devices). 6. Admitted for medical treatment of cancer, identified by the specific AHRQ CCS categories listed in the attached data dictionary.	a complication of care occurred. 2. Who were discharged against medical advice (AMA); or, Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. Who had more than two THA/TKA procedure codes during the index hospitalization Rationale: Although clinically possible, it is highly unlikely that patients would receive more than two elective THA/TKA procedures in one hospitalization, which may reflect a coding error.	<ul> <li>3) if the patient, has a sex other, than 'male' or 'female'.</li> <li>2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice enrollment data.</li> <li>3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator.</li> <li>After exclusions #1-3 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome.</li> <li>Additional admissions within that year are excluded.</li> <li>For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care is mutually independent.</li> <li>For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent.</li> <li>For the three- year combined data, when index admissions</li> <li>occur during the transition between measure includes only the June admission.</li> <li>The July admissions are excluded to avoid assigning a single death to tor</li> </ul>	after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database. Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse outcome or signal of poor quality care. 2. Discharg es against medical advice (AMA) are identified using the discharge disposition indicator in the claim. Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. Individual codes with descriptors can be found in the attached Data Dictionary.	Rationale: We do not include stays for patients where the age (indicated in the claim) is greater than 115, where the gender (indicated in the claim) is neither male nor female, where the admission date (indicated in the claim) is after the date of death in the Medicare Enrollment Database, or where the date of death (in the Medicare Enrollment Database) occurs before the date of discharge but the patient was discharged alive (indicated in the claim). 2. Discharged against medical advice (AMA). Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. This information is taken from the discharge disposition in the claim. 3. With more than one qualifying CABG surgery admission in the measurement period. Rationale: CABG procedures are expected to last for shoural tyeans withou the need for revision or repeat revascularization . A repeat CABG procedure sare expected to last for shoural tyeans withou the need for revision or repeat revascularization . A repeat CABG procedure during the measurement period likely represents a complication of the original CABG procedure and nigher risk surgery. Therefore, we select the first	had clinically significant AMI.2. Inconsistentor unknown vitalstatus or otherunreliabledemographicdataRationale: Wedo not includestays forpatients wherethe age isgreater than115, where thegender is neithermale nor female,where theadmission dateis after the dateof death in theMedicareEnrollmentDatabase, orwhere the dateof death occursbefore the dateof discharge butthe patient wasdischarge dalive.3. Enrolled in theMedicarehospice programor used VAhospice servicesany time in the12 months priorto the indexadmission,including thefirst day of theindex admission.Enrollment toMedicarebeneficiaries isdeterminedusing theMedicarepatients arelikely continuingto seek comfortmeasures only,so mortality isnot necessarilyan adverseoutcome orsignal of poorquality care.Attonale: Thesepatients arelikely continuingto seek comfortmeasures only,so mortality isnot necessarilyan divente

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All- Condition, All-	Unplanned Readmission	complication rate (RSCR) following	cause, risk- standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized Mortality		arthroplasty (THA) and/or total knee	following pneumonia	obstructive pulmonary	Following Coronary Artery	following acute myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
Rationale: To			the attached		admission for	admission per
calculate a stable and			Data Dictionary.		inclusion in the measure and	patient per year for inclusion in
precise risk					exclude	the cohort so
model, there					subsequent	that each
are a minimum number of					CABG surgery admissions	episode of care is mutually
admissions that					(additional	independent
are needed. In addition, a					claims indicating	with the same probability of
minimum					a CABG procedure was	the outcome.
number of					performed	Additional
admissions and/or					within 30-days	admissions within that year
outcome					of the index CABG	are excluded.
events are					procedure) from	For each patient,
required to inform					the cohort.	the probability of death
grouping						increases with
admissions into						each subsequent admission and
larger categories.						therefore the
These						episodes of care
admissions present						are not mutually independent.
challenges to						For the three-
both accurate						year combined
risk prediction and coherent						data, when
risk grouping						index admissions occur during the
and are						transition
therefore excluded.						between measure
Note: During						reporting
measure						periods (June
development we analyzed						and July of each year) and both
different						are randomly
volume cut-offs (25, 50 and						selected for
100). Using cut-						inclusion in the measure, the
off values						measure
below 100 resulted in too						includes only the June admission.
many CCS						July admissions
codes in some of the divisions						are excluded to
(the CCS						avoid assigning a single death to
category codes						two admissions.
are used in risk adjustment)						
which resulted						
in non- convergence of						
those division-						
level risk models. The						
total number of						
patients						
excluded is very small (13,597						
or 0.21% of						
admissions for						
a cut off of 100). During						
measure						
development we also						
explored the						
option of						
pooling low- volume CCS						
codes (CCS<100						
patients) into						
one group, however, the						
heterogeneity						
in mortality rates for the						
individual ICD-						
10 codes in						

		1700		0400	4002 11		0220 11
	3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure those groups would preclude adequate risk adjustment. The TEP supported excluding these	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
	admissions.						
Risk Adjustmen t	Statistical risk model	Statistical risk model Our approach to risk adjustment is tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes" (Krumholz et al., 2006). The HWR measure employs a hierarchical logistic regression model to create a hospital-level 30- day RSRR. In brief, the approach simultaneously models data at the patient and hospital levels to account for the variance in patient outcomes within and between hospitals (Normand & Shahian, 2007). At the patient level, the model adjusts the log- odds of readmission within 30 days of discharge for age and selected clinical covariates. At the hospital level, the approach models the hospital- specific intercepts as arising from a normal distribution. The hospital intercept represents the underly in sin after accounting for patient risk. If there were no differences	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model	Statistical risk model
		among hospitals, then after adjusting for					

	1700			1002		022011
3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure) Risk-	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Standardized		total hip arthroplasty (THA)	(RSMR) following	chronic obstructive	(RSMR) Following	(RSMR) following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
	postions with all			hospitalization	(CABG) Surgery	hospitalization
	patient risk, the hospital					
	intercepts should					
	be identical					
	across all hospitals.					
	We use a fixed,					
	common set of					
	variables in all our models for					
	simplicity and					
	ease of data					
	collection and					
	analysis. However, we					
	estimate a					
	hierarchical					
	logistic regression model for each					
	specialty cohort					
	separately, and					
	the coefficients associated with					
	each variable may					
	vary across					
	specialty cohorts.					
	Candidate and Final Risk-					
	adjustment					
	Variables: Candidate					
	variables were					
	patient-level risk-					
	adjustors that					
	were expected to be predictive of					
	readmission,					
	based on					
	empirical analysis, prior					
	literature, and					
	clinical judgment,					
	including age and indicators of					
	comorbidity and					
	disease severity.					
	For each patient, covariates are					
	obtained from					
	claims records					
	extending 12 months prior to					
	and including the					
	index admission.					
	For the measure currently					
	implemented by					
	CMS, these risk-					
	adjusters are identified using					
	inpatient					
	Medicare FFS					
	claims data.					
	The model adjusts for case-					
	mix differences					
	based on the					
	clinical status of patients at the					
	time of					
	admission. We					
	use condition					
	categories (CCs), which are					
	clinically					
	meaningful					
	groupings of more than 15,000					
	ICD-9-CM					
	diagnosis codes					

3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk-	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR)	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR)	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR)
Standardized Mortality Measure		arthroplasty (THA) and/or total knee arthroplasty (TKA)	following pneumonia hospitalization	obstructive pulmonary disease (COPD) hospitalization	Following Coronary Artery Bypass Graft (CABG) Surgery	following acute myocardial infarction (AMI) hospitalization
	(Pope et al., 2000). A file that contains a list of the ICD-9-CM codes and their groupings into CCs is attached in data field S.2b (Data Dictionary or Code Table). In addition, only comorbidities that convey information about the patient at admission or in the 12 months prior, and not complications that arise during the course of the index hospitalization, are included in the risk adjustment. Hence, we do not risk adjust for CCs that may represent adverse events of care when they are only recorded in the index admission. The models also include a condition-specific indicator for all AHRQ CCS categories with sufficient volume (defined as those with more than 1,000 admissions nationally each year for Medicare FFS data) as well as a single indicator for conditions with insufficient volume in each model. The final set of risk adjustment volume in each model.			disease (COPD)	Bypass Graft	infarction (AMI)
	or acute leukemia (CC 7) Severe cancer (CC 8-9) Other cancers (CC 10-12)					

	4700.0					
3504 Claims- Only Hospital-	1789 Hospital- Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	1893 Hospital 30- Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
	Severe hematological					
	disorders (CC 44)					
	Coagulation					
	defects and other					
	specified					
	hematological					
	disorders (CC 46)					
	Iron deficiency or					
	other unspecified anemias and					
	blood disease (CC					
	47)					
	End-stage liver					
	disease (CC 25-					
	26)					
	Pancreatic					
	disease (CC 32)					
	Dialysis status (CC					
	130) Renal failure (CC					
	131)					
	Transplants (CC					
	128, 174)					
	Severe infection					
	(CC 1, 3-5)					
	Other infectious					
	diseases and					
	pneumonias (CC 6, 111-113)					
	Septicemia/shock					
	(CC 2)					
	Congestive heart					
	failure (CC 80)					
	Coronary					
	atherosclerosis or					
	angina, cerebrovascular					
	disease (CC 81-					
	84, 89, 98-99,					
	103-106)					
	Specified					
	arrhythmias and					
	other heart rhythm disorders					
	(CC 92-93)					
	Cardio-					
	respiratory failure					
	or shock (CC 79)					
	Chronic					
	obstructive pulmonary					
	disease (COPD)					
	(CC 108)					
	Fibrosis of lung or					
	other chronic					
	lung disorders (CC 109)					
	Protein-calorie					
	malnutrition (CC					
	21)					
	Disorders of					
	fluid/electrolyte/					
	acid-base (CC 22- 23)					
	23) Rheumatoid					
	arthritis and					
	inflammatory					
	connective tissue					
	disease (CC 38)					
	Diabetes mellitus					
	(DM) or DM complications (CC					
	15-20, 119-120)					
	Decubitus ulcer					
	or chronic skin					
1		1	1	1	1	

	3504 Claims-	1789 Hospital-		Telefile I and a second second	1893 Hospital 30-		THE REPORT OF A DATA AND AND A DATA AND AND AND AND AND AND AND AND AND AN
	Only Hospital-	Wide All-Cause	1550 Hospital-level risk-standardized	0468 Hospital 30-day, all-	Day, all-cause,	2558 Hospital 30-Day, All-	0230 Hospital 30-day, all-
	Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
(	Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
	Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
	Risk- Standardized		total hip arthroplasty (THA)	(RSMR) following	chronic obstructive	(RSMR) Following	(RSMR) following acute
1	Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
	Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
					hospitalization	(CABG) Surgery	hospitalization
		ulcer (CC 148- 149)					
		Hemiplegia,					
		paraplegia,					
		paralysis, functional					
		disability (CC 67-					
		69, 100-102, 177-					
		178) Caisura dia andara					
		Seizure disorders and convulsions					
		(CC 74)					
		Respirator					
		dependence/trac heostomy status					
		(CC 77)					
		Drug/alcohol					
		psychosis or dependence (CC					
		51-52)					
		Psychiatric					
		comorbidity (CC 54-56, 58, 60)					
		54-56, 58, 60) Hip					
		fracture/dislocati					
		on (CC 158)					
		Principal Diagnoses					
		Refer to the 2015					
		Measure Updates					
		and Specifications:					
		Hospital-Wide All-					
		Cause Unplanned					
		Readmission - Version 4.0					
		referenced here					
		for the full lists of					
		principal diagnosis AHRQ					
		CCS categories					
		included in each					
		specialty cohort risk adjustment					
		model.					
		The ACR measure					
		employs the same risk adjustment					
		methodology and					
		uses the same risk variables.					
		References:					
		Krumholz HM,					
		Brindis RG, Brush JE, et al. 2006.					
		Standards for					
		Statistical Models					
		Used for Public Reporting of					
		Health Outcomes:					
		An American Heart Association					
		Scientific					
		Statement From					
		the Quality of Care and					
		Outcomes					
		Research					
		Interdisciplinary Writing Group:					
		Cosponsored by					
		the Council on Epidemiology and					
		Prevention and					
		the Stroke					
		Council Endorsed by the American					
		College of					
		Cardiology					

	3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
		Foundation. Circulation 113: 456-462. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22 (2): 206-226. Pope GC, et al. 2000. Principal Inpatient Diagnostic Cost Group Models for Medicare Risk Adjustment. Health Care Financing Review 21(3): 93-118. Available in attached Excel or csv file at S.2b					
Stratificati on	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Type Score	Rate/proportio n better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score
Algorithm	The measure estimates hospital-level, risk- standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log- odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying	This measure estimates a hospital-level 30- day all-cause RSRR using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient, and hospital levels to account for variance in patient outcomes within and between hospitals (Normand et al., 2007). At the patient level, it models the log- odds of readmission within 30 days of discharge using age, selected clinical covariates, and a hospital -specific effect. At the hospital level, the approach models the hospital- specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of a readmission, after accounting for patient risk. The hospital- specific effects are given a distribution to	The measure estimates hospital- level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log- odds of a complication occurring within 90 days of the index admission using age, sex, selected clinical covariates, and a hospital- specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a complication at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non- independence) of patients within the	The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for pneumonia using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital,	The measure estimates hospital-level 30- day all-cause RSMRs following hospitalization for COPD using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific	The measure estimates hospital-level 30-day all-cause RSMRs for CABG surgery using a hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of the procedure date using age, sex, selected clinical covariates, and a hospital-specific effect. At the hospital-specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-	The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for AMI using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of discharge using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercept as arising from a normal distribution. The hospital, intercept represents the underlying risk of mortality at the hospital, after accounting

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
differences in	account for the	same hospital. If	after accounting	intercepts are	specific effects	for patient risk.
quality among	clustering (non-	there were no	for patient risk.	given a	are given a	The hospital-
the health care	independence) of	differences among	The hospital-	distribution to	distribution to	specific
facilities being	patients within	hospitals, then after	specific	account for the	account for the	intercepts are
evaluated lead	the same hospital (Normand et al.,	adjusting for patient	intercepts are	clustering (non-	clustering (non-	given a distribution to
to systematic differences in	2007). If there	risk, the hospital intercepts should	given a distribution to	independence) of patients within	independence) of patients	account for the
outcomes. We	were no	be identical across	account for the	the same	within the same	clustering (non-
estimated a	differences	all hospitals.	clustering (non-	hospital. If there	hospital	independence)
separate	among hospitals,	The RSCR is	independence)	were no	(Normand and	of patients
hierarchical	then after	calculated as the	of patients	differences	Shahian, 2007).	within the same
logistic	adjusting for	ratio of the number	within the same	among hospitals,	If there were no	hospital. If there
regression	patient risk, the	of "predicted" to	hospital. If there	then after	differences	were no
model for each	hospital effects	the number of	were no	adjusting for	among hospitals,	differences
service-line	should be	"expected"	differences	patient risk, the	then after	among hospitals,
division. In	identical across	admissions with a	among hospitals,	hospital	adjusting for	then after
order to obtain	all hospitals.	complication at a	then after	intercepts should	patient risk, the	adjusting for
the variance	Admissions are	given hospital,	adjusting for	be identical	hospital effects	patient risk, the
and interval	assigned to one	multiplied by the	patient risk, the	across all	should be	hospital
estimates, we fit the	of five mutually	national observed	hospital	hospitals.	identical across	intercepts should be
hierarchical	exclusive	complication rate.	intercepts should be	The RSMR is	all hospitals.	identical across
model under	specialty cohort	For each hospital, the numerator of	identical across	calculated as the ratio of the	The RSMR is	all hospitals.
the Bayesian	groups consisting of related	the ratio is the	all hospitals.	number of	calculated as the ratio of the	The RSMR is
framework	conditions or	number of	The RSMR is	"predicted" to	number of	calculated as the
along with the	procedures. For	complications	calculated as the	the number of	"predicted"	ratio of the
Markov Chain	each specialty	within 90 days	ratio of the	"expected"	deaths to the	number of
Monte Carlo	cohort group, the	predicted on the	number of	deaths at a given	number of	"predicted" to
(MCMC)	standardized	basis of the	"predicted" to	hospital,	"expected"	the number of
technique.	readmission ratio	hospital's	the number of	multiplied by the	deaths at a given	"expected"
Admissions are	(SRR) is calculated	performance with	"expected"	national observed	hospital,	deaths,
assigned to one	as the ratio of the	its observed case	deaths at a given	mortality rate.	multiplied by the	multiplied by the
of 15 mutually	number of	mix, and the	hospital,	For each hospital,	national	national
exclusive	"predicted"	denominator is the	multiplied by the	the numerator of	observed	unadjusted
divisions	readmissions to	number of	national observed	the ratio is the	mortality rate.	mortality rate.
(groups of discharge	the number of "expected"	complications expected based on	observed mortality rate.	number of deaths within 30 days	For each hospital, the	For each hospital, the
condition	readmissions at a	the nation's	For each	predicted on the	numerator of	numerator of
categories and	given hospital.	performance with	hospital, the	basis of the	the ratio is the	the ratio
procedure	For each hospital,	that hospital's case	numerator of	hospital's	number of	("predicted") is
categories). For	the numerator of	mix. This approach	the ratio is the	performance with	deaths within 30	the number of
each division	the ratio is the	is analogous to a	number of	its observed case	days predicted	deaths within 30
and each	number of	ratio of "observed"	deaths within 30	mix, and the	based on the	days predicted
hospital with	readmissions	to "expected" used	days predicted	denominator is	hospital's	on the basis of
patients in that	within 30 days	in other types of	on the basis of	the number of	performance	the hospital's
division, the	predicted based	statistical analyses.	the hospital's	deaths expected	with its	performance
standardized	on the hospital's	It conceptually	performance	based on the	observed case	with its
mortality ratio	performance with	allows for a	with its	nation's	mix, and the	observed case
(SMR) is	its observed case	comparison of a	observed case	performance with	denominator is	mix, and the
calculated as the ratio of the	mix and service mix, and the	particular hospital's performance given	mix, and the denominator is	that hospital's case mix. This	the number of deaths expected	denominator ("expected") is
number of	denominator is	its case mix to an	the number of	approach is	based on the	the number of
"predicted"	the number of	average hospital's	deaths expected	analogous to a	nation's	deaths expected
deaths to the	readmissions	performance with	based on the	ratio of	performance	on the basis of
number of	expected based	the same case mix.	nation's	"observed" to	with that	the nation's
"expected"	on the nation's	Thus, a lower ratio	performance	"expected" used	hospital's case	performance
deaths at a	performance with	indicates lower-	with that	in other types of	mix. This	with that
given hospital.	that hospital's	than-expected	hospital's case	statistical	approach is	hospital's case
The predicted	case mix and	complication rates	mix This	analyses It	analogous to a	mix This

The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospitalspecific effect on the risk of mortality. The estimated hospitalspecific effect

case mix and service mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service

complication rates or better quality, and a higher ratio indicates higherthan-expected complication rates or worse quality. The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of having an admission with a complication. The estimated hospitalmix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio

analyses. It conceptually ratio of allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-thanexpected average mortality rates or better quality, and a higher ratio indicates higherthan-expected mortality rates or worse quality.

analogous to a mix. This "observed" to "expected" used ratio of in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix, to be compared to an hospital's average performance with the same case mix. Thus, a lower ratio indicates lowerthan-expected

approach is analogous to a "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an hospital's performance with the same case mix. Thus, a lower ratio

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality Measure		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Ivieasure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
for cosh cohort	main Thurs a lawyar	an a sifi a interna at is	in directory lawyou	hospitalization	(CABG) Surgery	hospitalization
for each cohort is added to the	mix. Thus, a lower ratio indicates	specific intercept is added to the sum of	indicates lower- than-expected	The "predicted" number of deaths	mortality rates or better quality,	indicates lower- than-expected
sum of the	lower-than-	the estimated	mortality rates	(the numerator)	while a higher	mortality or
estimated	expected	regression	or better quality,	is calculated by	ratio indicates	better quality
regression	readmission rates	coefficients	and a higher	using the	higher-than-	and a higher
coefficients	or better quality,	multiplied by the	ratio indicates	coefficients	expected	ratio indicates
multiplied by	while a higher	patient	higher-than-	estimated by	mortality rates	higher-than-
patient	ratio indicates	characteristics. The	expected	regressing the	or worse quality.	expected
characteristics.	higher-than-	results are log	mortality rates	risk factors and	The "predicted"	mortality or
The results are	expected	transformed and	or worse quality.	the hospital-	number of	worse quality.
transformed via	readmission rates	summed over all	The "predicted"	specific intercept	deaths (the	The "predicted"
an inverse logit function and	or worse quality.	patients attributed	number of	on the risk of	numerator) is	number of
summed over	For each specialty	to a hospital to get a predicted value.	deaths (the	mortality. The estimated	calculated by	deaths (the
all patients	cohort, the "predicted"	The "expected"	numerator) is calculated by	hospital-specific	using the coefficients	numerator) is calculated by
attributed to a	number of	number of	using the	effect is added to	estimated by	using the
hospital to get	readmissions (the	admissions with a	coefficients	the sum of the	regressing the	coefficients
a predicted	numerator) is	complication (the	estimated by	estimated	risk factors and	estimated by
value. The	calculated by	denominator) is	regressing the	regression	the hospital-	regressing the
expected	using the	obtained in the	risk factors and	coefficients	specific effect on	risk factors and
number of	coefficients	same manner, but a	the hospital-	multiplied by the	the risk of	the hospital-
deaths is based	estimated by	common intercept	specific	patient	mortality. The	specific
on the nation's performance	regressing the	using all hospitals in our sample is added	intercept on the	characteristics.	estimated	intercept on the
with that	risk factors (found in Table D.9) and	in place of the	risk of mortality. The estimated	The results are log transformed	hospital-specific effect is added	risk of mortality. The estimated
hospital's case	the hospital-	hospital-specific	hospital-specific	and summed over	to the sum of	hospital-specific
mix and service	specific effect on	effect. The results	effect is added	all patients	the estimated	effect is added
mix and is	the risk of	are log transformed	to the sum of	attributed to a	regression	to the sum of
obtained in the	readmission. The	and summed over	the estimated	hospital to get a	coefficients	the estimated
same manner,	estimated	all patients in the	regression	predicted value.	multiplied by the	regression
but a common	hospital-specific	hospital to get an	coefficients	The "expected"	patient	coefficients
effect using all	effect for each	expected value. To	multiplied by the	number of deaths	characteristics.	multiplied by the
hospitals in our	cohort is added	assess hospital performance for	patient	(the	The results are	patient
sample is added in place	to the sum of the	each reporting	characteristics.	denominator) is obtained in the	log transformed	characteristics.
of the hospital-	estimated	period, we re-	The results are	same manner,	and summed	The results are
specific effect.	regression coefficients	estimate the model	log transformed and summed	but a common	over all patients attributed to a	log transformed and summed
The results are	multiplied by	coefficients using	over all patients	intercept using all	hospital to get a	over all patients
transformed via	patient	the years of data in	attributed to a	hospitals in our	predicted value.	attributed to a
an inverse logit	characteristics.	that period.	hospital to get a	sample is added	The "expected"	hospital to get a
function and	The results are	This calculation	predicted value.	in place of the	number of	predicted value.
summed over	log transformed	transforms the ratio	The "expected"	hospital-specific	deaths (the	The "expected"
all patients in	and summed over	of predicted over	number of	intercept. The	denominator) is	number of
the hospital to get an expected	all patients	expected into a rate	deaths (the	results are log transformed and	obtained in the	deaths (the
value. This	attributed to a hospital to get a	that is compared to the national	denominator) is obtained in the	summed over all	same manner, but a common	denominator) is obtained in the
approach is	predicted value.	observed	same manner,	patients in the	effect using all	same manner,
analogous to a	The "expected"	complication rate.	but a common	hospital to get an	hospitals in our	but a common
ratio of	number of	The hierarchical	intercept using	expected value.	sample is added	intercept using
"observed" to	readmissions (the	logistic regression	all hospitals in	To assess hospital	in place of the	all hospitals in
"expected"	denominator) is	models are	our sample is	performance for	hospital-specific	our sample is
used in other	obtained in the	described fully in	added in place	each reporting	effect. The	added in place
types of	same manner,	the original	of the hospital-	period, we re-	results are log	of the hospital
statistical	but a common	methodology report	specific	estimate the	transformed and	specific
analyses. It	effect using all	(Grosso et al.,	intercept. The	model	summed over all	intercept. The
conceptually allows a	hospitals in our	2012).	results are log	coefficients using the years of data	patients in the	results are log
particular	sample is added in place of the	References:	transformed and summed over all	in that period.	hospital to get an expected	transformed and summed over all
hospital's	hospital-specific	Grosso L, Curtis J,	patients in the	This calculation	value. To assess	patients in the
1 P P P P		Lioppy of al		ייייייייייייייייייייייייייייייייייייייי	* uiuci i U UJJCJJ	

hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-thanexpected mortality rates or better quality, while a higher ratio indicates higher-thanexpected

hospital-specific effect. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we reestimate the model coefficients using the data in that period. The specialty cohort SRRs are then pooled for each hospital using a volumeweighted

Geary L, et al. Hospital-level Risk-Standardized **Complication Rate Following Elective** Primary Total Hip Arthroplasty (THA) And/Or Total Knee Arthroplasty (TKA) Measure Methodology Report. 2012. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of **Hospital Outcomes** Profiling. Stat Sci 22(2): 206-226.

patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we reestimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References: 1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of

value. To assess hospital performance for each reporting period, we reestimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic

patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we reestimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed

 3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
mortality rates	geometric mean		readmission	Hospital	regression	readmission
or worse	to create a		rate. The	Outcomes	models are	rate. The
quality.	hospital-wide		hierarchical	Profiling. Stat Sci	described fully in	hierarchical
To assess	composite SRR.		logistic	22(2): 206-226.	the original	logistic
hospital	The composite		regression	2. Krumholz H,	methodology	regression
performance	SRR is multiplied		models are	Normand S,	report (Suter et	models are
for each	by the national		described fully in	Galusha D, et al.	al. 2012).	described fully in
reporting	observed		the original	2005. Risk-	Reference:	the original
period, the	readmission rate		methodology	Adjustment	1. Normand S-	methodology
measure re-	to produce the RSRR. The		report (Krumholz et al.,	Models for AMI	LT, Shahian DM.	report (Krumholz et al.,
estimates the model	statistical		2005).	and HF 30-Day	2007. Statistical	2005).
coefficients	modeling		References:	Mortality	and Clinical	References:
using the data	approach is		1. Normand S-	Methodology.	Aspects of Hospital	1. Normand S-
in that period.	described fully in		LT, Shahian DM.		Outcomes	LT, Shahian DM.
The division-	Appendix A and in		2007. Statistical		Profiling. Stat Sci	2007. Statistical
level SMRs are	the original		and Clinical		22(2): 206-226.	and Clinical
then pooled for	methodology		Aspects of		2. Suter L, Wang	Aspects of
each hospital	report (Horwitz et		Hospital		C, Araas M, et al.	Hospital
using an	al., 2012).		Outcomes		Hospital-Level	Outcomes
inverse	The ACR quality		Profiling. Stat Sci		30-day All-Cause	Profiling. Stat Sci
variance-	measure was		22(2): 206-226.		Mortality	22(2): 206-226.
weighted	adapted from the		2. Krumholz H,		Following	2. Krumholz H,
geometric	HWR quality measure. The unit		Normand S,		Coronary	Normand S,
mean to create	of analysis was		Galusha D, et al.		Artery Bypass	Galusha D, et al.
a hospital-wide	changed from the		2005. Risk-		Graft Surgery;	Risk-Adjustment
composite SMR. The	hospital to the		Adjustment		Updated	Models for AMI
hospital-wide	ACO. This was		Models for AMI		Measure	and HF 30-Day
SMR is then	possible because		and HF 30-Day		Methodology	Mortality
multiplied by	both the HWR		Mortality Methodology.		Report. 2012	Methodology. 2005.
the national	and ACR		wethouology.			2005.
observed	measures assess					
mortality rate	readmission					
to produce the	performance for a					
RSMR.	population that					
	clusters patients together (either					
	in hospitals or in					
	ACOs). The goal is					
	to isolate the					
	effects of					
	beneficiary					
	characteristics on					
	the probability					
	that a patient will					
	be readmitted from the effects					
	of being in a					
	specific hospital					
	or ACO. In					
	addition, planned					
	readmissions are					
	excluded for the					
	ACR quality					
	measure in the					
	same way that					
	they are excluded					
	for the HWR					

for the HWR			
measure. The			
ACR measure is			
calculated			
identically to			
what is described			
above for the			
HWR measure.			
References:			
Horwitz L,			
Partovian C, Lin Z,			
et al. Hospital-			
Wide All-Cause			
Unplanned			
Readmission			
Measure: Final			
Technical Report.			
2012;			
http://www.quali			
tynet.org/dcs/Blo			
bServer?blobkey=			
id&blobnocache=			

	3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
	Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
	Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
	Condition, All- Procedure)	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
	Risk-	Measure (HWR)	elective primary total hip	mortality rate (RSMR)	(RSMR) following chronic	Mortality Rate (RSMR)	mortality rate (RSMR)
	Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
	Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
	Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
		tau a Q la la la un la ana			hospitalization	(CABG) Surgery	hospitalization
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		bs. Accessed 30					
		April, 2014.					
		Normand S-LT,					
		Shahian DM. 2007. Statistical					
		and Clinical					
		Aspects of					
		Hospital					
		Outcomes Profiling. Stat Sci					
		22(2): 206-226.					
		Available in					
		attached appendix at A.1					
Submission	5.1 Identified	5.1 Identified	5.1 Identified	5.1 Identified	5.1 Identified	5.1 Identified	5.1 Identified
items	measures:	measures: 1768 :	measures: 0534 :	measures: 0708 :	measures: 0701 :	measures: 0114 :	measures: 2431 :
	5a.1 Are specs	Plan All-Cause	Hospital specific	Proportion of	Functional	Risk-Adjusted	Hospital-level,
	completely	Readmissions (PCR)	risk-adjusted measure of	Patients with Pneumonia that	Capacity in COPD patients before	Postoperative Renal Failure	risk- standardized
	harmonized? Yes	1891 : Hospital	mortality or one or	have a	and after	0115 : Risk-	payment
		30-day, all-cause,	more major	Potentially	Pulmonary	Adjusted	associated with
	5a.2 If not completely	risk-standardized	complications	Avoidable	Rehabilitation	Surgical Re-	a 30-day
	harmonized,	readmission rate (RSRR) following	within 30 days of a lower extremity	Complication (during the	0700 : Health- related Quality of	exploration	episode-of-care for Acute
	identify	chronic	bypass (LEB).	episode time	Life in COPD	0119 : Risk- Adjusted	Myocardial
	difference, rationale,	obstructive	0564 : Cataracts:	window)	patients before	Operative	Infarction (AMI)
	impact: This	pulmonary	Complications	0231 :	and after	Mortality for	1789 : Hospital-
	claims-only	disease (COPD) hospitalization	within 30 Days Following Cataract	Pneumonia Mortality Rate	Pulmonary Rehabilitation	CABG	Wide All-Cause Unplanned
	hospital-wide	1551 : Hospital-	Surgery Requiring	(IQI #20)	0275 : Chronic	0122 : Risk- Adjusted	Readmission
	mortality (HWM)	level 30-day risk-	Additional Surgical	0506 : Hospital	Obstructive	Operative	Measure (HWR)
	measure is	standardized	Procedures	30-day, all-	Pulmonary	Mortality for	1891 : Hospital
	intended to	readmission rate (RSRR) following	1551 : Hospital-level 30-day risk-	cause, risk- standardized	Disease (COPD) or Asthma in Older	Mitral Valve (MV)	30-day, all- cause, risk-
	complement the existing	elective primary	standardized	readmission rate	Adults Admission	Replacement +	standardized
	CMS Hospital-	total hip	readmission rate	(RSRR) following	Rate (PQI 05)	CABG Surgery	readmission rate
	Wide All-Cause	arthroplasty (THA) and/or	(RSRR) following elective primary	pneumonia hospitalization	1891 : Hospital 30-day, all-cause,	0123 : Risk-	(RSRR) following chronic
	Risk- Standardized	total knee	total hip	0279 :	risk-standardized	Adjusted Operative	obstructive
	Readmission	arthroplasty (TKA)	arthroplasty (THA)	Community	readmission rate	Mortality for	pulmonary
	Measure (NQF	0695 : Hospital 30-Day Risk-	and/or total knee arthroplasty (TKA)	Acquired Pneumonia	(RSRR) following chronic	Aortic Valve	disease (COPD) hospitalization
	#1789) to allow assessment of	Standardized	2052 : Reduction of	Admission Rate	obstructive	Replacement (AVR) + CABG	1551 : Hospital-
	trends in	Readmission	Complications	(PQI 11)	pulmonary	Surgery	level 30-day risk-
	hospital	Rates following	through the use of	2579 : Hospital-	disease (COPD)	0129 : Risk-	standardized
	performance for both	Percutaneous Coronary	Cystoscopy during Surgery for Stress	level, risk- standardized	hospitalization	Adjusted	readmission rate (RSRR) following
	readmission	Intervention (PCI)	Urinary	payment	5a.1 Are specs completely	Postoperative Prolonged	elective primary
	and mortality	0329 : Risk-	Incontinence	associated with	harmonized? Yes	Intubation	total hip
	outcomes, similar to other	Adjusted 30-Day All-Cause	5a.1 Are specs	a 30-day episode of care for	5a.2 If not	(Ventilation)	arthroplasty (THA) and/or
	complementary	Readmission Rate	completely harmonized? Yes	pneumonia (PN)	completely	0130 : Risk- Adjusted Deep	total knee
	pairs of	0330 : Hospital	5a.2 lf not	5a.1 Are specs	harmonized, identify	Adjusted Deep Sternal Wound	arthroplasty
	readmission and mortality	30-day, all-cause,	completely	completely	difference,	Infection	(TKA) 0506 : Hospital
	measures for	risk-standardized readmission rate	harmonized,	harmonized? No	rationale, impact:	0131 : Risk-	30-day, all-
1 1	specific	(RSRR) following	identify difference, rationale, impact:	5a.2 If not	We did not include in our list	Adjusted Stroke/Cerebrov	cause, risk-
			We did not include	completely harmonized,	of related	ascular Accident	standardized readmission rate
	conditions and	heart failure (HF)	we did not include			1	- ronamicción rato
	procedures. By	hospitalization	in our list of related	identify	measures any	0229 : Hospital	
		hospitalization 0505 : Hospital	in our list of related measures any non-	identify difference,	non-outcome (for	30-day, all-	(RSRR) following pneumonia
	procedures. By measuring mortality outcomes	hospitalization	in our list of related	identify difference, rationale,		30-day, all- cause, risk-	(RSRR) following pneumonia hospitalization
	procedures. By measuring mortality	hospitalization 0505 : Hospital 30-day all-cause	in our list of related measures any non- outcome measures	identify difference,	non-outcome (for example, process)	30-day, all-	(RSRR) following pneumonia

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All-	Readmission	(RSCR) following	standardized	mortality rate	Standardized	standardized
Procedure)				· · · · · · · · · · · · · · · · · · ·		
	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk-		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
measure will	acute myocardial	target population as	measure cohort,	measure. Our	following heart	cause, risk-
provide an	-	our measure.	version 9.0, is	measure cohort	failure (HF)	standardized
•	infarction (AMI)		-			
important	hospitalization.	Because this is an	harmonized with	was heavily	hospitalization	readmission rate
additional	0506 : Hospital	outcome measure,	the hospital-	vetted by clinical	0230 : Hospital	(RSRR) following
performance	30-day, all-cause,	clinical coherence	level, risk-	experts, a	30-day, all-	heart failure (HF)
assessment	risk-standardized	of the cohort takes	standardized	technical expert	cause, risk-	hospitalization
that will	readmission rate	precedence over	payment	panel, and a	standardized	0505 : Hospital
complement	(RSRR) following	alignment with	associated with	public comment	mortality rate	30-day all-cause
condition- and	pneumonia	related non-	a 30-day episode	period.	(RSMR)	risk-
procedure-		outcome measures.	of care for	Additionally, the		
•	hospitalization			-	following acute	standardized
specific or	5a.1 Are specs	Furthermore, non-	pneumonia	measure, with	myocardial	readmission rate
other more	completely	outcome measures	cohort. Version	the specified	infarction (AMI)	(RSRR) following
narrowly	harmonized? No	are limited due to	9.2 of the	cohort, has been	hospitalization	acute
defined		broader patient	pneumonia	publicly reported	for patients 18	myocardial
mortality	5a.2 lf not	exclusions. This is	mortality	since December	and older	infarction (AMI)
measures and	completely	because they	measure cohort	2014. Because	0468 : Hospital	hospitalization.
allow a greater	harmonized,	typically only	is, however, not	this is an	30-day, all-	1893 : Hospital
number of	identify	include a specific	harmonized with	outcome	cause, risk-	30-Day, all-
patients and	difference,	subset of patients	the pneumonia	measure, clinical	standardized	• •
hospitals to be	rationale, impact:	who are eligible for	payment	coherence of the		cause, risk-
evaluated. This	This measure and	that measure (for	measure cohort.	cohort takes	mortality rate	standardized
HWM measure	the National	example, patients	There is	precedence over	(RSMR)	mortality rate
	Committee for	who receive a	intention to	alignment with	following	(RSMR)
captures a	Quality Assurance			-	pneumonia	following
similarly broad	(NCQA) Plan All-	specific medication	harmonize the	related non-	hospitalization	chronic
cohort to the		or undergo a	pneumonia	outcome	0535 : 30-day	obstructive
CMS Hospital-	Cause	specific procedure).	mortality and	measures.	, all-cause risk-	pulmonary
Wide All-Cause	Readmissions	5b.1 If competing,	payment	Furthermore,	standardized	disease (COPD)
Risk-	(PCR) Measure	why superior or	measure cohorts	non-outcome	mortality rate	hospitalization
Standardized	#1768 are related	<i>,</i> , ,	in the future.	measures are	following	0468 : Hospital
Readmission	measures, but are	rationale for	We did not	limited due to	J	30-day, all-
Measure (NQF	not competing	additive value:	include in our	broader patient	percutaneous	• •
#1789), and a	because they	N/A	list of related	exclusions. This is	coronary	cause, risk-
broader cohort	don't have the		measures any	because they	intervention	standardized
than those of	same measure		non-outcome	typically only	(PCI) for patients	mortality rate
other CMS	focus and same		(for example,	include a specific	without ST	(RSMR)
condition-	target population.		process)	subset of patients	segment	following
specific	In addition, both		measures with	who are eligible	elevation	pneumonia
•	have been			-	myocardial	hospitalization
measures.	previously		the same target	for that measure	infarction	0229 : Hospital
Because the	harmonized to		population as	(for example,	(STEMI) and	30-day, all-
mortality	the extent		our measure.	patients who	without	cause, risk-
measure is	possible under		Because this is	receive a specific	cardiogenic	standardized
focused on a	•		an outcome	medication or	shock	mortality rate
different	the guidance of		measure, clinical	undergo a specific	0536 : 30-day	(RSMR)
outcome, it	the National		coherence of the	procedure).		· ·
differs from the	Quality Forum		cohort takes	5b.1 If	all-cause risk-	following heart
existing CMS	Steering		precedence over		standardized	failure (HF)
Hospital-Wide	Committee in		alignment with	competing, why	mortality rate	hospitalization
All-Cause Risk	2011. Each of		related non-	superior or	following	5a.1 Are specs
Standardized	these measures		outcome	rationale for	Percutaneous	completely
Readmission	has different		measures.	additive value:	Coronary	harmonized? Yes
Measure (NQF	specifications.		Furthermore,	N/A	Intervention	
#1789) in a	NCQA's Measure		non-outcome	-	(PCI) for patients	5a.2 If not
couple of ways.	#1768 counts the		measures are		with ST segment	completely
First, this HWM	number of		limited due to		elevation	harmonized,
measure	inpatient stays for		broader patient		myocardial	identify
	patients aged 18		•		infarction	difference,
includes	and older during		exclusions. This		(STEMI) or	rationale,
patients with a	-		is because they		cardiogenic	impact: We did
principal	a measurement		typically only		shock	not include in
discharge	year that were followed by an		include a specific		1502 · Risk-	our list of
diagnosis of	LINNING NV an		subset of	1		

diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions

followed by an acute readmission for any diagnosis to any hospital within 30 days. It contrasts this count with a calculation of the predicted probability of an acute readmission. NCQA's measure is intended for quality monitoring and accountability at the health plan level. This measure estimates the

subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Lastly, this measure and the NQF Inpatient Pneumonia Mortality (AHRQ) Measure #0231 are complementary rather than competing measures.

1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery 1893 : Hospital 30-Day, allcause, riskstandardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization 2515 : Hospital 30-day, allcause,

our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts. Additionally, the measure, with the specified cohort, has been publicly reported since 2008. Because this is an outcome measure, clinical

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital- Wide (All-	Wide All-Cause	risk-standardized	30-day, all- cause, risk-	Day, all-cause,	30-Day, All-	30-day, all-
Condition, All-	Unplanned Readmission	complication rate (RSCR) following	standardized	risk-standardized mortality rate	Cause, Risk- Standardized	cause, risk- standardized
Procedure)	Measure (HWR)	elective primary	mortality rate	(RSMR) following	Mortality Rate	mortality rate
Risk- Standardized		total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Mortality		arthroplasty (THA) and/or total knee	following pneumonia	obstructive pulmonary	Following Coronary Artery	following acute myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD)	Bypass Graft	infarction (AMI)
				hospitalization	(CABG) Surgery	hospitalization
are frequently part of the plan	risk-standardized rate of		Although they both assess		unplanned, risk- standardized	coherence of the cohort takes
and expected	unplanned, all-		mortality for		readmission rate	precedence over
and therefore,	cause		patients		(RSRR) following	alignment with
are not a reasonable	readmissions to a hospital or ACO		admitted to acute care		coronary artery bypass graft	related non- outcome
signal of	for any eligible		hospitals with a		(CABG) surgery	measures.
quality. Another	condition within 30 days of		principal		5a.1 Are specs	Furthermore,
difference	hospital discharge		discharge diagnosis of		completely harmonized? Yes	non-outcome measures are
between the	for patients aged		pneumonia, the		5a.2 lf not	limited due to
two measures is the number	18 and older. The measure will		specified outcomes are		completely	broader patient exclusions. This
of divisions or	result in a single		different. This		harmonized,	is because they
specialty	summary risk-		measure		identify difference,	typically only
cohorts the patients are	adjusted readmission rate		assesses 30-day mortality while		rationale,	include a specific subset of
divided into, to	for conditions or		#0231 assesses		impact: We did	patients who are
more	procedures that		inpatient		not include in our list of	eligible for that
accurately risk adjust for case-	fall under five specialties:		mortality. Assessment of		related	measure (for example,
mix and	surgery/gynecolo		30-day and		measures any	patients who
service-mix. The	gy, general medicine,		inpatient mortality		non-outcome (e.g., process)	receive a specific medication or
readmission	cardiorespiratory,		outcomes have		measures with	undergo a
measure	cardiovascular,		distinct		the same target population as	specific
divides patients into five	and neurology. This measure is		advantages and uses which make		our measure.	procedure).
categories, or	specified for		them		Our measure cohort was	5b.1 If competing,
"specialty cohorts", while	evaluating hospital or ACO		complementary as opposed to		heavily vetted by	why superior
the mortality	performance.		competing. For		clinical experts,	or rationale for
measure uses	However, despite		example the 30-		a technical expert panel,	additive value:
15. This is because the	these differences in cohort		day period provides a		and a public	N/A
risk of mortality	specifications,		broader		comment period. In	
is much more closely related	both measures under NQF		perspective on hospital care		addition, the	
to patient	guidance have		and utilizes		related claims-	
factors than	been harmonized		standard time		based CABG readmission	
readmission is related to	to the extent possible through		period to examine hospital		measure, which	
patient factors.	modifications		performance to		utilizes the same definition of	
PSI-02 (NQF #0357) is	such as exclusion of planned		avoid bias by differences in		isolated CABG as	
another	readmissions. We		length of stay		the mortality	
complementary	did not include in		among hospitals.		measure, was validated using	
mortality measure, which	our list of related measures any		However, in some settings it		STS clinical	
captures a	non-outcome		may not be		registry data. Because this is	
different patient	(e.g., process) measures with		feasible to capture post-		an outcome	
population and	the same target		discharge		measure, clinical	
a different	population as our		mortality making		coherence of the cohort takes	
outcome compared with	measure. Because this is an		the inpatient measure more		precedence over	
the HWM	outcome		useable. We		alignment with related non-	
measure submitted with	measure, clinical coherence of the		have previously consulted with		outcome	
this application.	cohort takes		AHRQ to		measures.	
PSI-02 captures patients 18	precedence over alignment with		examine harmonization		Furthermore, non-outcome	
years of age or	related non-		of		measures are	
older, or	outcome		complementary		limited due to broader patient	
obstetric patients,	measures. Furthermore,		measures of mortality for		exclusions. This	
whereas the	non-outcome		patients with		is because they	
HWM measure	measures are		AMI and stroke. We have found		typically only include a specific	
captures patients	limited due to broader patient		that the		subset of	
between the	exclusions. This is		measures are		patients who are eligible for that	
ages of 65 and 94. PSI-02	because they typically only		harmonized to the extent		measure (for	
captures DRGs	include a specific		possible given		example,	
with less than	subset of patients		that small		patients who receive a specific	
0.5% mortality rate, whereas	who are eligible for that measure		differences in cohort inclusion		medication or	
the HWM	(for example,		and exclusion		undergo a specific	
measure captures all	patients who receive a specific		criteria are warranted on		procedure).	
patients within	medication or		the basis of the			

3504 Claims-	1789 Hospital-	1550 Hospital-level	0468 Hospital	1893 Hospital 30-	2558 Hospital	0230 Hospital
Only Hospital-	Wide All-Cause	risk-standardized	30-day, all-	Day, all-cause,	30-Day, All-	30-day, all-
Wide (All-	Unplanned	complication rate	cause, risk-	risk-standardized	Cause, Risk-	cause, risk-
Condition, All- Procedure)	Readmission Measure (HWR)	(RSCR) following elective primary	standardized mortality rate	mortality rate (RSMR) following	Standardized Mortality Rate	standardized mortality rate
Risk-	Measure (HWK)	total hip	(RSMR)	chronic	(RSMR)	(RSMR)
Standardized		arthroplasty (THA)	following	obstructive	Following	following acute
Mortality		and/or total knee	pneumonia	pulmonary	Coronary Artery	myocardial
Measure		arthroplasty (TKA)	hospitalization	disease (COPD) hospitalization	Bypass Graft (CABG) Surgery	infarction (AMI) hospitalization
all CCSs,	undergo a specific		use of different	nospitalization	5b.1 lf	nospitalization
regardless of	procedure).		outcomes.		competing,	
mortality rate.	5b.1 lf		However, this		why superior	
Hospital-wide	competing, why		current measure		or rationale for	
mortality captures	superior or		has been modified from		additive value:	
mortality up to	rationale for		the last		The NQF-	
30 days past	additive value:		endorsed		endorsed STS measure that	
admission, where AHRQ	N/A		version to include patients		has the same	
PSI-02 only			with a principal		target	
, captures in-			discharge		population and	
hospital			diagnosis of		similar measure focus as the	
mortality. IQI 90 (NQF #0530)			sepsis and a secondary		proposed CABG	
is another			discharge		mortality	
complimentary			diagnosis of		measure is the	
mortality			pneumonia that		Risk-adjusted operative	
measure, which is a composite			is present on admission. The		mortality for	
measure of the			cohort was also		CABG (NQF	
number of in-			expanded to		#0119). The measure	
hospital deaths for a narrow			include patients with a principal		steward for the	
range of			discharge		registry-based	
conditions			diagnosis of		mortality	
(CHF, stroke, hip fracture,			aspiration		measure for CABG is STS. In	
pneumonia,			pneumonia. Thus the current		developing the	
acute			measure cohort		measure, we	
myocardial			is no longer		sought to	
infarction and GI			harmonized with measure #0231.		harmonize with the STS measure	
hemorrhage).			5b.1 lf		to the greatest	
The HWM			competing,		extent feasible	
measure			why superior		given competing	
presented in this application			or rationale for		measure design objectives and	
captures all			additive value:		differences in	
deaths after 30			N/A		the data source.	
days of admission, for					The potential	
all conditions					sources of discrepancy are	
and					target patient	
procedures.					population, age,	
5b.1 lf					isolated CABG, period of	
competing, why superior or					observation, and	
rationale for					included	
additive value:					hospitals. The	
There are no competing					STS measure also assesses	
NQF-endorsed					both deaths	
measures.					occurring during	
					CABG hospitalization	
					(in-hospital	
					death, even if	
					after 30 days)	
					and deaths occurring within	
					30 days of	
					procedure date.	
					As indicated	
					above, the proposed	
					measure uses a	
					standard follow-	
					up period of 30	
					days of procedure date	
					in order to	
					measure each	
					patient consistently. The	
					proposed	
					claims-based	
					measure has	
					been tested and	
	<u> </u>				is appropriate	

3504 Claims- Only Hospital- Wide (All- Condition, All- Procedure) Risk- Standardized Mortality Measure	1789 Hospital- Wide All-Cause Unplanned Readmission Measure (HWR)	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	0468 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following pneumonia hospitalization	1893 Hospital 30- Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization	2558 Hospital 30-Day, All- Cause, Risk- Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	0230 Hospital 30-day, all- cause, risk- standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization
					for use in all- payer data for patients 18 years and over. Finally, the STS cardiac surgery registry currently enrolls most, but not all, patients receiving CABG surgeries in the U.S. The proposed CABG mortality measure will capture all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry.	

# Comparison of NQF 3504, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530 continued...

	3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
	Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
Steward	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services	Centers for Medicare & Medicaid Services (CMS)	Agency for Healthcare Research and Quality	Agency for Healthcare Research and Quality
Description	Niedicald Services (CMS)The measure estimates a hospital-level 30-day hospital-wide risk- standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.Please note that in parallel with the claims- only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.Below we highlight the differences in the measure (risk adjustment).Differences in the measure (risk adjustment).Differences in the measure (risk adjustment).Differences in the 	The measure estimates a 	This stroke mortality measure estimates the hospital-level, risk- standardized mortality rate (RSMR) for patients discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30- day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a newly developed measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity in the risk- adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.	In-hospital deaths per 1,000 discharges for low mortality (< 0.5%) Diagnosis Related Groups (DRGs) among patients ages 18 years and older or obstetric patients. Excludes cases with trauma, cases with cancer, cases with an immunocompromised state, and transfers to an acute care facility. [NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]	A composite measure of in-hospital mortality indicators for selected conditions.

	3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
	Hospital-Wide (All- Condition, All-Procedure)	cause, risk-standardized mortality rate (RSMR)	cause, risk-standardized mortality rate (RSMR)	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
	Risk-Standardized	following heart failure (HF)	following acute ischemic	Nelated Groups (FSIOZ)	
	Mortality Measure	hospitalization	stroke hospitalization with claims-based risk		
			adjustment for stroke severity		
	(EHR) database from 21				
	hospitals in the Kaiser Permanente network				
	which includes inpatient				
	claims data information.				
	<ol><li>Age of patients in cohort:</li></ol>				
	a. The claims-only				
	measure includes Medicare FFS patients,				
	age 65-94.				
	b. The hybrid				
	measure includes all patients age 50-94 (see				
	later discussion for				
	justification) 3. External empiric				
	validity testing				
	a. Not possible for the hybrid measure, due				
	to limited data				
	availability. We provide results from the claims-				
	only measure within the				
	hybrid testing form.				
	4. Socioeconomic risk factor analyses				
	a. Not possible for				
	the hybrid measure, due to limited data				
	availability. We provide				
	results from the claims- only measure within the				
	hybrid testing form.				
	5. Exclusion				
	analyses a. To be				
	representative of what				
	we expect the impact would be of the				
	measures' exclusions in a				
	nation-wide sample, we provide the results from				
	the claims-only measure.				
	6. Meaningful differences				
	a. To be				
	representative of what				
	we expect the range of performance would be in				
	a nation-wide sample, we				
	provide the distribution results from the claims-				
	only measure.				
	Difference between the two measures when fully				
	harmonized, prior to				
	implementation:				
	1.Risk adjustment:a.The claims-only				
	measure uses				
	administrative claims data only for risk adjustment				
	b. The hybrid				
	measure adds 10 clinical				
	risk variables, derived from a set of core clinical				
	data elements (CCDE) extracted from the EHR.				
Туре	Outcome	Outcome	Outcome	Outcome	Composite
Data Source	Claims, Enrollment Data,	Claims, Other, Paper	Claims (Only), Other,	Claims While the measure	Electronic administrative
	Other Data sources for	Medical Records Data sources for the Medicare	Registry For measure	is tested and specified	data/claims
	the Medicare FFS measure:	sources for the Medicare FFS measure:	implementation the data sources will be:	using data from the Healthcare Cost and	
	1. Medicare Part A	1. Medicare Part A	1. Medicare Part A	Utilization Project (HCUP)	
	Inpatient: The index dataset contains	inpatient and Part B outpatient claims: This	inpatient and Part B outpatient claims: This	(see section 1.1 and 1.2 of the measure testing form),	
	administrative inpatient	data source contains	data source contains	the measure specifications	
	hospitalization data for Medicare FFS	claims data for FFS inpatient and outpatient	claims data for fee-for service inpatient and	and software are specified to be used with any ICD-9-	
L				,	I

3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. 2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment. No data collection instrument provided Attachment De118b1H0P5HWMClaim sDataDictionary01072019 .xlsx	services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. 2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). 3. Veterans Health Administration (VA) Data: This data source contains claims data for VA inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission. All-payer data sources: For our analyses to examine use in all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adut discharges from more than 450 non- Federal alc. Recore home height history from previous hospitalizations and to evaluate rates of both readmy evaluate rates of bot	outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission. 2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission, as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). 3. For measure development purposes only, we linked the data sources above with data from the AHA/ASA GWTG- Stroke Registry. The registry data were used to obtain the National Institutes of Health (NIH) Stroke Scale scores and clinical risk variables. When this measure is implemented NIH Stroke Scale scores will be derived from ICD-10 codes in Medicare claims. Reference: Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91. Data sources for the all- payer update No data collection instrument provided Attachment NQF_2876_Claims- Only_Stroke_Mortality_S2 b_Mortality_Data_Dictiona ry_v1.0- 635884757617681755.xlsx	CM-coded administrative billing/claims/discharge dataset with Present on Admission (POA) information. Note that in Version 5.0 (April 2015), the AHRQ QI software will no longer support prediction of POA status using an embedded prediction module. Users are expected to provide POA data. Available at measure- specific web page URL identified in S.1 Attachment PSI_02_Death_Rate_in_Lo w- Mortality_Diagnosis_Relat ed_GroupsDRGs _Editable.xlsx	

	3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
	Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
		California vital statistics records). Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the HF mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference: Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91. No data collection instrument provided Attachment NQF_0229_S2b_HF_Morta lity_Data_Dictionary_v1.0_ Final- 636973301131111819.xlsx			
Level Setting	Facility Inpatient/Hospital	Facility Inpatient/Hospital, Other Hospital & amp; Hospital: Acute Care Facility	Facility Hospital	Facility Inpatient/Hospital	Facility/Agency Hospital
Numerator Statement	The outcome for this measure is 30-day, all- cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.	The outcome for this measure is 30-day all- cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients 65 and older discharged from the hospital with a principal diagnosis of HF. Additional details are provided in S.5 Numerator Details.	The outcome for this measure is 30-day, all- cause mortality. We define mortality as death from any cause within 30 days of the index admission for patients with a principal discharge diagnosis of acute ischemic stroke.	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.	Number of in-hospital deaths
Numerator Details	The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.	Outcome Definition The measure counts deaths for any cause within 30 days of the date of admission of the index HF hospitalization. Rationale: From a patient perspective, death is a critical outcome regardless of cause. Outcomes occurring within 30 days of the start of the admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2017; Dharmarajan et al., 2015). Identifying deaths in the FFS measure As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare	The measure outcome is death from any cause within 30 days of the index admission date. As currently specified, we identify deaths for FFS Medicare patients, age 65 years and older, in the Medicare Enrollment Database (EDB).	Not applicable	Number of in-hospital deaths for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicat ors.ahrq.gov/Modules/IQI_ TechSpec.aspx).

	3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
Denominator Statement	The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.	Enrollment Database (EDB). Identifying deaths in the all-payer measure For the purposes of development of an all- payer measure, deaths were identified using the California vital statistics data file. Nationally, post- discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI). Reference: 1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk- Standardized Mortality Measures. http://www.qualitynet.org /dcs/ContentServer?c=Pag e&pagename=QnetPublic/ Page/QnetTier3&cid=1163 010421830. Accessed June 7, 2017. 2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411 This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have explicitly tested the measure in both age groups. The cohort for the publically reported measure includes admissions for patients aged 65 years and older discharge diagnosis of HF and with a complet cohoths sitory for the 12 months prior to admission. The measure includes admistor portients for years and older who are either Medicare FFS beneficiaries admitted to VA hospitals. Additional details are provided in S.7 Denominator Details.	The cohort includes inpatient admissions to all non-federal, short-term, acute care hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke. Additional details are provided in S.9 Denominator Details.	Discharges, for patients ages 18 years and older or MDC 14 (pregnancy, childbirth, and puerperium), with a low- mortality (less than 0.5% mortality) MS-DRG code (LOWMODR). If an MS- DRG is divided into "without/with (major) complications and comorbidities," both codes without complications/comorbiditi es and codes with (major) complications/comorbiditi es must have mortality rates below 0.5% in the reference population to qualify for inclusion.	Number of eligible discharges (all indicators are limited to the adult population)
Denominator Details	An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients: 1. Enrolled in Medicare FFS Part A for at least 12	To be included in the HF measure cohort used in public reporting, patients must meet the following additional inclusion criteria:	The denominator includes all Medicare FFS beneficiaries, age 65 and over, with a principal discharge diagnosis of acute ischemic stroke. To be included in the measure	LOWMODR: Low-mortality (less than 0.5%) MS-DRG codes (See attached technical specifications for detailed list of codes.)	Number of eligible adult discharges for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage (separately).

Hospita Conditio Risk-Sta	iims-Only -Wide (All- m, All-Procedure) ndardized y Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
of admi the inde Rationa consiste for Med benefici month p criterion year of data is a adjustm 2. Not ti another Rationa an acute within c discharg acute ca conside Transfee included cohort, hospital than an hospital included cohort, hospital the mor attribut admissi 3. Aged 94 years Rationa patients are not measure usually program disabilit conside distinct patients Patients not inclu	ransferred from acute care facility e: Admissions to e cate hospital ne day of ge from another re hospital are red transfers. red patients are d in the measure but it is the initial ization rather y "transfer-in" ization(s), that is d as the ization to which tality outcome is ed (the index on). between 65 and	<ol> <li>Have a principal discharge diagnosis of heart failure (HF);</li> <li>Enrolled in Medicare Fee-For-Service (FFS)Part A and Part B for the 12 months prior to the date of the index admission and Part A during the index admission, or those who are VA beneficiaries (in the cases of the AMI, HF, and pneumonia measures);</li> <li>Aged 65 or over; and,</li> <li>Not transferred from another acute care facility.</li> <li>VA beneficiaries are eligible for inclusion in the AMI, HF, and pneumonia measure cohorts regardless of Medicare FFS enrollment or whether they were hospitalized in a VA or non-VA short-term acute care hospital.</li> <li>This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years.</li> <li>ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.</li> </ol>	Sectoritycohort used in publicreporting, patients mustmeet the followingadditional inclusioncriteria:1. Enrolled in Medicarefee-for-service (FFS) duringthe index admission;2. Not transferred fromanother acute care facility;and3. Enrolled in Part A andPart B Medicare for the 12months prior to the date ofindex admission.ICD-9-CM codes thatdefine the patient cohort:433.01433.11Occlusion andstenosis of basilar arterywith cerebral infarction433.11Occlusion andstenosis of vertebral arterywith cerebral infarction433.21Occlusion andstenosis of vertebral arterywith cerebral infarction433.31Occlusion andstenosis of ther specifiedprecerebral artery withcerebral infarction433.81Occlusion andstenosis of unspecifiedprecerebral artery withcerebral infarction434.01Cerebralinfarction434.01Cerebralinfarction434.91Cerebral arteryocclusion, unspecified withcerebral infarction434.91Cerebral arteryocclusion, unspecified withcerebral infarction436Acute, but ill-defined, cerebrovasculardisease </td <td></td> <td>See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicat ors.ahrq.gov/Modules/IQI_ TechSpec.aspx).</td>		See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicat ors.ahrq.gov/Modules/IQI_ TechSpec.aspx).

admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

infarction due to embolism of unspecified carotid artery I63.239 Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries I63.019 Cerebral infarction due to thrombosis of unspecified vertebral artery I63.119 Cerebral infarction due to embolism of unspecified vertebral artery I63.219 Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries

3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
Hospital-Wide (All-	cause, risk-standardized	cause, risk-standardized	Mortality Diagnosis	Selected Conditions
Condition, All-Procedure) Risk-Standardized	mortality rate (RSMR)	mortality rate (RSMR)	Related Groups (PSI02)	
Mortality Measure	following heart failure (HF) hospitalization	following acute ischemic stroke hospitalization with		
		claims-based risk		
		adjustment for stroke		
4. Not admitted for		severity 163.59 Cerebral		
primary psychiatric		infarction due to		
diagnoses		unspecified occlusion or		
Rationale: Patients admitted for psychiatric		stenosis of other cerebral artery		
treatment are typically		I63.20 Cerebral		
cared for in separate		infarction due to		
psychiatric facilities that are not comparable to		unspecified occlusion or stenosis of unspecified		
short-term acute care		precerebral arteries		
hospitals (see data		l63.30 Cerebral		
dictionary, HWM Non- Acute Care Inclusion tab).		infarction due to thrombosis of unspecified		
5. Not admitted for		cerebral artery		
rehabilitation		l63.40 Cerebral		
Rationale: These		infarction due to embolism		
admissions are not typically to a short-term		of unspecified cerebral artery		
acute care hospital and		163.50 Cerebral		
are not for acute care (see data dictionary,		infarction due to		
HWM Non-Acute Care		unspecified occlusion or stenosis of unspecified		
Inclusion tab).		cerebral artery		
6. Not enrolled in hospice		I67.8 Other specified		
at the time of, or 12 months prior to, their		cerebrovascular diseases I67.89 Other		
index admission		cerebrovascular diseases		
Rationale: Patients		An ICD-9 to ICD-10		
enrolled in hospice in the prior 12 months or at the		crosswalk is attached in		
time of admission are		field S.2b. (Data Dictionary or Code Table).		
unlikely to have 30-day survival as a primary goal.		,		
7. Not enrolled in hospice				
within two days of				
admission				
Rationale: There is not a single, correct approach				
regarding patients				
enrolled in hospice during				
admission or upon discharge – mortality may				
or may not represent a				
quality signal for this group of patients and				
hospice enrollment is				
inadequate to				
differentiate this issue. However, for most				
patients and/or families				
who had the discussion and agreed to enroll in				
hospice within two days				
of admission, 30-day				
survival is not likely the primary goal due to their				
condition and not the				
quality of care received.				
8. Not with a principal diagnosis of cancer and				
enrolled in hospice during				
their index admission				
Rationale: Patients admitted primarily for				
cancer who are enrolled				
in hospice during				
admission are unlikely to have 30-day survival as a				
primary goal of care. (see				
data dictionary, HWM Cancer Inclusion tab).				
9. Without any diagnosis				
of metastatic cancer				
Rationale: Although some				
patients admitted with a diagnosis of metastatic				
cancer will have 30-day				
survival as a primary goal				
of care, for many such patients admitted to the				
hospital, death may be a				

3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
Hospital-Wide (All- Condition, All-Procedure)	cause, risk-standardized	cause, risk-standardized	Mortality Diagnosis	Selected Conditions
Risk-Standardized	mortality rate (RSMR) following heart failure (HF)	mortality rate (RSMR) following acute ischemic	Related Groups (PSI02)	
Mortality Measure	hospitalization	stroke hospitalization with claims-based risk		
		adjustment for stroke		
clinically reasonable and		severity		
patient-centered				
outcome. (see data dictionary, HWM				
Metastatic Cancer				
Inclusion tab). 10. Not with a principal				
discharge diagnosis, or a				
secondary diagnosis that is present on admission				
(POA) for a condition				
which hospitals have limited ability to influence				
survival				
Rationale: Hospitals have little ability to impact				
mortality for some				
conditions. This list of conditions (see data				
dictionary, HWM ICD-10 Inclusion tab) was				
determined through				
independent review, by several clinicians, of				
conditions associated				
with high mortality. The decisions were also				
reviewed with our				
Technical Expert Panel (TEP) and Technical Work				
Group. Admissions are				
not included in the cohort if the patient had a				
principal diagnosis code				
that is on this list, or a secondary code with POA				
that is on the list.				
In addition, for patients with multiple admissions,				
the measure selects only one admission, at				
random, for inclusion.				
There is no practical statistical modeling				
approach that can				
account or adjust for the complex relationship				
between the number of admissions and risk of				
mortality in the context of				
a hospital-wide mortality measure. Random				
selection ensures that				
providers are not penalized for a "last"				
admission during the				
measurement period; selecting the last				
admission would not be as accurate a reflection of				
the risk of death as				
random selection, as the last admission is				
inherently associated				
with a higher mortality risk. Random selection is				
also used in CMS's				
condition-specific mortality measures. Note				
that random selection				
reduces the number of admissions, but does not				
exclude any patients from the measure.				
The cohort is defined				
using ICD-10 Clinical Modification codes				
identified in Medicare				
Part A Inpatient claims data. The measure				
aggregates the ICD-10				
principal diagnosis and all				

3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
Hospital-Wide (All- Condition, All-Procedure)	cause, risk-standardized mortality rate (RSMR)	cause, risk-standardized mortality rate (RSMR)	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
Risk-Standardized	following heart failure (HF)	following acute ischemic		
Mortality Measure	hospitalization	stroke hospitalization with claims-based risk		
		adjustment for stroke		
procedure codes of the		severity		
index admission into				
clinically coherent groups of conditions and				
procedures (condition				
categories or procedure				
categories) using the Agency for Healthcare				
Research and Quality				
(AHRQ) Clinical Classifications System				
(CCS). There is a total of				
285 mutually exclusive AHRQ condition				
categories, most of which				
are single, homogenous diseases such as				
pneumonia or acute				
myocardial infarction.				
Some are aggregates of conditions, such as "other				
bacterial infections".				
There is a total of 231 mutually exclusive				
procedure categories.				
Using the AHRQ CCS procedure and condition				
categories, the measure				
assigns each index				
hospitalization to one of 15 mutually exclusive				
divisions. The divisions				
were created based upon clinical coherence,				
consistency of mortality				
risk, adequate patient and hospital case volume for				
stable results reporting,				
and input from clinicians, patients, and patient				
caregivers on usability.				
The measure first assigns				
admissions with qualifying AHRQ				
procedure categories to				
one of six surgery divisions by identifying a				
defining surgical				
procedure. The defining surgical procedure is				
identified using the				
following algorithm: 1) if a patient only has one				
major surgical procedure				
then that procedure is the				
defining surgical procedure; 2) if a patient				
has more than one major				
surgical procedure, the first dated procedure				
performed during the				
index admission is the defining surgical				
procedure; 3) if there is				
more than one major surgical procedure on				
that earliest date, the				
procedure with the highest mortality rate is				
the defining surgical				
procedure. These				
divisions include admissions likely cared				
for by surgical teams.				
The surgical divisions are: Surgical Cancer (see note				
below), Cardiothoracic				
Surgery, General Surgery,				
Neurosurgery, Orthopedic Surgery, and Other				
Surgical Procedures.				

	3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
	Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
Exclusions	For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel. The measure then assigns the remaining admissions into one of the nine non- surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions. The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary. The measure excludes index admissions for patients: 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data; 2. Discharged against medical advice (AMA); 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 233), Crushing injury or internal injury (CCS 240); and 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.	The HF mortality measure excludes index hospitalizations that meet any of the following exclusion criteria: 1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; 2. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission; or, 3. Discharged against medical advice. 4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility; or 5. With a procedure code for LVAD implantation or heart transplantation either during the index admission. For patients with more than one admission for a given condition in a given year, only one index admission for tat given condition in a given year, only one index	The measure excludes admissions for patients: 1. With inconsistent or unknown vital status or other unreliable data; 2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission; and 3. Discharged against medical advice (AMA). For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.	Exclude cases: • with any listed ICD-10- CM diagnosis codes for trauma (Appendix G: TRAUMID) • with any listed ICD-10- CM diagnosis codes for cancer (Appendix H: CANCEID) • with any listed ICD-10- CM diagnosis codes for immunocompromised state (Appendix I: IMMUNID) • with any listed ICD-10- PCS procedure codes for immunocompromised state (Appendix I: IMMUNID) • with any listed ICD-10- PCS procedure codes for immunocompromised state (Appendix I: IMMUNIP) • transfer to an acute care facility (DISP=2) • with missing discharge disposition (DISP=missing), age (AGE=missing), quarter (DQTR=missing), or principal diagnosis (DX1=missing)	Indicator specific
Exclusion Details	<ol> <li>With inconsistent or unknown vital status (from claims data) or other unreliable claims data Rationale: The measure does not include stays for patients where the</li> </ol>	<ol> <li>Inconsistent or unknown vital status or other unreliable demographic data</li> <li>Inconsistent vital status or unreliable data are identified if any of the following conditions are</li> </ol>	1. Inconsistent vital status or unreliable data: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the	Appendix G: Trauma Diagnosis Codes Appendix H: Cancer Diagnosis Codes Appendix I: Immunocompromised	See Inpatient Quality Indicators: Technical Specifications for additional details (available at

3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data. 2. Discharged against medical advice (AMA) Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 240) Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals. 4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year. Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions nthat division spresent challenges to both accurate risk prediction and coherent risk grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded. Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the division-level risk models. The total number of admissions free cused in risk adjustment) which resulted in non- convergence of those division-level risk models. The total number of patients excluded is very smient (13,597 or 0.21% of admissions for a cut off of	met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male' Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive. 2. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission Rationale: Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient standard analytic file (SAF). This exclusion applies when the measure is used in Medicare FFS patients only. Rationale: These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care. 3. Discharged against medical advice Discharges against medical advice are identified using the discharge disposition indicator. Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility. The discharge disposition indicator is used to identify patients alive at discharge. Transfers are identified using the discharge disposition indicator is used to identify patients alive at discharge. Transfers are identified is a discharge disposition indicator is used to identify patients alive at discharge. Transfers are identified is and admitted to another acute care hospital on the same day or next day. Rationale: this unlikely that these patients had clinically significant HFc. 5. With ap procedure come facute ace hospital and admitted to another acute care hospital on the ither dury and the indexient day and the index admi	date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive. 2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient Standard Analytic File (SAF). These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care for these patients. 3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator. After all exclusions are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of theo outcome. For each patient, the probability of death increases with each subsequent admission, and therefore, the episodes of care are not mutually independent. Similarly, for the three year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.	State Diagnosis and Procedure Codes (See attached Appendix G, Appendix H, and Appendix I for detailed list of codes.)	http://www.qualityindicat ors.ahrq.gov/Modules/IQI_ TechSpec.aspx).

	3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
	100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.	or in the 12 months prior to the index admission Patients with LVAD implantation or heart transplantation during an index admission or in the previous 12 months are identified by the corresponding codes for these procedures included in claims data. Rationale: These patients represent a clinically distinct group (ICD-10-PCS code list). The data sources for these analyses are Medicare administrative claims and enrollment information for patients with hospitalizations between July 1, 2013 and June 30, 2016. After exclusions #1-5 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admissions are excluded to avoid assigning a single death to two admissions.			
Risk Adjustment Stratification	Statistical risk model	Statistical risk model	Statistical risk model	No risk adjustment or risk stratification	No risk adjustment or risk stratification
Type Score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Not applicable Rate/proportion better quality = lower score	
Algorithm	The measure estimates hospital-level, risk- standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level	The measure estimates hospital-level 30-day all- cause RSMRs following hospitalization for HF using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical	The measure estimates hospital-level, 30-day, all- cause RSMRs following hospitalization for stroke using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, selected clinical covariates,	Risk adjustment is not currently included in the ICD-10-CM/PCS v2018 of the AHRQ QI specifications, due to the transition to ICD-10- CM/PCS (October 1, 2015). At least one full year of data coded in ICD-10- CM/PCS is needed in order to develop robust risk adjustment models. A full year of ICD-10-CM/PCS coded all-payer data will not be available until mid- 2019. AHRQ will announce an anticipated date as soon as one is known.	

3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique. Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific	covariates, and a hospital- specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals. The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix.			
effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed	Thus, a lower ratio indicates lower-than- expected mortality rates or better quality, and a higher ratio indicates higher-than- expected mortality rates or worse quality. The "predicted" number of doaths (the sumerator) is	Thus, a lower ratio indicates lower-than- expected mortality rates or better quality, and a higher ratio indicates higher-than- expected mortality rates or worse quality. The "predicted" number of doctes (the sumerator) is		

results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospitalspecific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to

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deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in

deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in

	3504 Claims-Only Hospital-Wide (All-	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
	Condition, All-Procedure) Risk-Standardized Mortality Measure	cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
	a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower ratio indicates lower rhan-expected mortality rates or better quality, while a higher ratio indicates higher- than-expected mortality rates or worse quality. To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period. The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.	place of the hospital- specific intercept. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re- estimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References: 1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226. 2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.	place of the hospital- specific intercept. The results are transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re- estimate the model coefficients using the years of data in that period. This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2011). References: Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.		
Submission items	5.1 Identified measures: 5a.1 Are specs completely harmonized? Yes	5.1 Identified measures: 0358 : Heart Failure Mortality Rate (IQI 16)	5.1 Identified measures: 0467 : Acute Stroke Mortality Rate (IQI 17)	5.1 Identified measures: 5a.1 Are specs completely harmonized?	5.1 Identified measures: 5a.1 Are specs completely harmonized?
	5a.2 If not completely harmonized, identify difference, rationale, impact: This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital- Wide All-Cause Risk- Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and	1893 : Hospital 30-Day, all- cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization 0468 : Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization 0230 : Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization 1891 : Hospital 30-day, all- cause, risk-standardized	5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non- outcome (such as process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader	5a.2 If not completely harmonized, identify difference, rationale, impact: not applicable 5b.1 If competing, why superior or rationale for additive value: Not applicable	<ul> <li>5a.2 If not completely harmonized, identify difference, rationale, impact:</li> <li>5b.1 If competing, why superior or rationale for additive value:</li> </ul>

procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedurespecific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS

readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization 1551 : Hospital-level 30day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) 0506 : Hospital 30-day, allcause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization 0330 : Hospital 30-day, allcause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Additionally, this measure and the NQF endorsed Acute Stroke Mortality Rate (IQI 17) (AHRQ) Measure #0467 are complementary and related rather than competing measures. Although they both assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of acute ischemic stroke, the

3504 Claims-Only	0229 Hospital 30-day, all-	2876 Hospital 30-day, all-	0347 Death Rate in Low-	0530 Mortality for
Hospital-Wide (All- Condition, All-Procedure)	cause, risk-standardized mortality rate (RSMR)	cause, risk-standardized mortality rate (RSMR)	Mortality Diagnosis Related Groups (PSI02)	Selected Conditions
Risk-Standardized	following heart failure (HF)	following acute ischemic		
Mortality Measure	hospitalization	stroke hospitalization with claims-based risk		
		adjustment for stroke		
condition-specific	0505 : Hospital 30-day all-	severity specified outcomes are		
measures. Because the mortality measure is	cause risk-standardized readmission rate (RSRR)	different. Our measure assesses 30-day mortality,		
focused on a different	following acute myocardial	while #0467 assesses		
outcome, it differs from	infarction (AMI)	inpatient mortality. The		
the existing CMS Hospital- Wide All-Cause Risk	hospitalization. 1789 : Hospital-Wide All-	30-day mortality and inpatient mortality		
Standardized Readmission	Cause Unplanned	outcomes each have		
Measure (NQF #1789) in a couple of ways. First, this	Readmission Measure (HWR)	distinct advantages and uses, which make them		
HWM measure includes	5a.1 Are specs completely	complementary (and		
patients with a principal discharge diagnosis of	harmonized? Yes	related) as opposed to competing. For example		
cancer (with some	5a.2 If not completely	the 30-day period provides		
exceptions), whereas those patients are not	harmonized, identify difference, rationale,	a broader perspective on hospital care and utilizes a		
included in the	impact: We did not include	standard time period to		
readmission measure. Cancer patients are	in our list of related measures any non-	examine hospital performance to avoid bias		
appropriate to include in	outcome (e.g., process)	by differences in length of		
the HWM measure as	measures with the same target population as our	stay among hospitals.		
many have survival as their primary goal;	measure. Our measure	However, in some settings it may not be feasible to		
however due to cancer	cohort was heavily vetted by clinical experts, a	capture post-discharge		
treatment plans, readmissions are	technical expert panel, and	mortality, making the inpatient measure more		
frequently part of the	a public comment period. Additionally, the measure,	useable. We have		
plan and expected and therefore, are not a	with the specified cohort,	previously consulted with AHRQ to examine		
reasonable signal of	has been publicly reported	harmonization of the		
quality. Another difference between the	since 2008. Because this is an outcome measure,	measures' cohort. As a result of that		
two measures is the	clinical coherence of the	collaboration, we have		
number of divisions or specialty cohorts the	cohort takes precedence over alignment with	found that the measures' cohorts are harmonized to		
patients are divided into,	related non-outcome	the extent possible and		
to more accurately risk adjust for case-mix and	measures. Furthermore, non-outcome measures	that the small differences in cohort inclusion and		
service-mix. The	are limited due to broader	exclusion criteria are		
readmission measure divides patients into five	patient exclusions. This is because they typically only	appropriate because the measures assess different		
categories, or "specialty	include a specific subset of	outcomes.		
cohorts", while the mortality measure uses	patients who are eligible for that measure (for	5b.1 If competing, why		
15. This is because the	example, patients who	superior or rationale for additive value: This		
risk of mortality is much more closely related to	receive a specific medication or undergo a	measure looks at a longer		
patient factors than	specific procedure).	outcome time frame (30- days versus in-hospital)		
readmission is related to patient factors. PSI-02	5b.1 If competing, why	and incorporates stroke		
(NQF #0357) is another	superior or rationale for additive value: N/A	severity into the risk- model.		
complementary mortality measure, which captures	auuruve value. N/A	The current publicly		
a different patient		reported measure, Hospital 30-Day Mortality		
population and a different		Following Acute Ischemic		
outcome compared with the HWM measure		Stroke Hospitalization		
submitted with this		Measure, is a potentially competing measure. It is		
application. PSI-02 captures patients 18		CMS intent to replace the		
years of age or older, or		current measure in any given program with this		
obstetric patients, whereas the HWM		newly developed measure,		
measure captures		which includes stroke severity in the risk model.		
patients between the ages of 65 and 94. PSI-02		The Hybrid Hospital 30-		
captures DRGs with less		Day, All-Cause, Risk- Standardized Mortality		
than 0.5% mortality rate, whereas the HWM		Rate (RSMR) Following		
measure captures all		Acute Ischemic Stroke with Risk Adjustment for Stroke		
patients within all CCSs, regardless of mortality		Risk Adjustment for Stroke Severity measure is also		
rate. Hospital-wide		being submitted to NQF		
mortality captures mortality up to 30 days		for endorsement. This measure uses a		
past admission, where		combination of claims and		
AHRQ PSI-02 only captures in-hospital		electronic health records (EHR) data for risk		
mortality. IQI 90 (NQF		adjustment but is		
#0530) is another		otherwise harmonized with the new claims-only		
complimentary mortality measure, which is a		measure. It is CMS intent		
composite measure of the		to implement only one of		

3504 Claims-Only Hospital-Wide (All- Condition, All-Procedure) Risk-Standardized Mortality Measure	0229 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization	2876 Hospital 30-day, all- cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity	0347 Death Rate in Low- Mortality Diagnosis Related Groups (PSI02)	0530 Mortality for Selected Conditions
number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.		the new stroke mortality measures (this claims-only measure or the hybrid measure) in any given program.		
5b.1 If competing, why superior or rationale for additive value: There are no competing NQF- endorsed measures.				

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### **Appendix E2: Related and Competing Measures (narrative format)**

# Comparison of NQF 3502, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

### Steward

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Centers for Medicare & Medicaid Services (CMS)

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Centers for Medicare & Medicaid Services (CMS)

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Centers for Medicare & Medicaid Services

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Centers for Medicare & Medicaid Services (CMS)

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Centers for Medicare & Medicaid Services

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Centers for Medicare & Medicaid Services

### Description

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and

use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.

b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

- 2. Age of patients in cohort:
- a. The claims-only measure includes Medicare FFS patients, age 65-94.
- b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

4. Socioeconomic risk factor analyses

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

5. Exclusion analyses

a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.

6. Meaningful differences

a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
- a. The claims-only measure uses administrative claims data only for risk adjustment

b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

For the hospital-wide readmission (HWR) measure that was previously endorsed and is used in the Hospital Inpatient Quality Reporting Program (IQR), the measure estimates a hospitallevel risk-standardized readmission rate (RSRR) of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge. The measure reports a single summary RSRR, derived from the volume-weighted results of five different models, one for each of the following specialty cohorts based on groups of discharge condition categories or procedure categories: surgery/gynecology; general medicine; cardiorespiratory; cardiovascular; and neurology, each of which will be described in greater detail below. The measure also indicates the hospital-level standardized risk ratios (SRR) for each of these five specialty cohorts. The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission (the admission included in the measure cohort). A specified set of planned readmissions do not count in the readmission outcome. CMS annually reports the measure for patients who are 65 years or older, are enrolled in fee-for-service (FFS) Medicare, and hospitalized in non-federal hospitals.

For the All-Cause Readmission (ACR) measure version used in the Shared Savings Program (SSP), the measure estimates an Accountable Care Organization (ACO) facility-level RSRR of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge. The ACR measure is calculated using the same five specialty cohorts and estimates an ACO-level standardized risk ratio for each. CMS annually reports the measure for patients who are 65 years or older, are enrolled in FFS Medicare and are ACO assigned beneficiaries.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The measure estimates a hospital-level risk-standardized complication rate (RSCR) associated with elective primary THA and TKA in Medicare Fee-For-Service beneficiaries who are 65 years and older. The outcome (complication) is defined as any one of the specified complications occurring from the date of index admission to 90 days post date of the index admission (the admission included in the measure cohort). The target population is patients 18 and over. CMS annually reports the measure for patients who are 65 years or older, are enrolled in fee-for-service (FFS) Medicare, and hospitalized in non-federal acute-care hospitals.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA). Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for-service (FFS) beneficiaries and hospitalized in non-federal acute care hospitals.

### 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD. Mortality is defined as death from any cause within 30 days of

the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are Medicare fee-for-service (FFS) beneficiaries hospitalized in non-federal acute care hospitals

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 30 days of the procedure date of an index CABG admission. An index CABG admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older and was tested in all-payer patients 18 years and older.

#### Туре

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Outcome

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- 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) Outcome
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Outcome

- 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization Outcome
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Outcome

### Data Source

#### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Claims, Electronic Health Records, Other Clinical-Hybrid Dataset

Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).

The two data sources listed below were used for testing the claims-based measure; the

hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).

HWM claims-only datasets:

Medicare Part A Inpatient Claims Data

The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.

Medicare Enrollment Database (EDB)

This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

No data collection instrument provided Attachment Del18b2HOP5HWMHybridDataDictionary01072019.xlsx

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Claims Data sources for the Medicare FFS measure:

HWR

1. Medicare Part A claims data for calendar years 2007 and 2008 were combined and then randomly split into two equal subsets (development sample and validation sample). Risk variable selection was done using the development sample, the risk models for each of the five specialty cohorts in the measure were applied to the validation sample and the models' performance was compared. In addition we re-tested the models in Medicare Part A claims data from calendar year 2009 to look for temporal stability in the models' performance. The number of measured entities and index admissions are listed below by specialty cohort.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission and following discharge from index admission

ACR

1. Medicare Part A claims data for calendar years 2013, 2014, and 2015.

2. Medicare Enrollment Database (EDB).

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

Available in attached appendix at A.1 Attachment NQF\_1789\_NQF\_Data\_Dictionary\_05-26-17\_v1.0.xlsx

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Claims, Other, Paper Medical Records Data sources:

The currently publically reported measure is specified and has been tested using:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status at discharge. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

During original measure development we validated the administrative claims-based definition of THA/TKA complication (original model specification) against a medical record data.

3. Data abstracted from medical records from eight participating hospitals (approximately 96 records per hospital; 644 total records) for Medicare beneficiaries over the age of 65 years who had a qualifying THA/TKA procedure between January 1 2007 and December 31, 2008.

The measure was also specified and testing using an all-payer claims dataset although it is only publically reported using the data sources listed above

4. California Patient Discharge Data is a large, linked database of patient hospital admissions in the state of California. Using all-payer data from California, we performed analyses to determine whether the THA/TKA complication measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 years or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Additional Data source used for analysis of the impact of SES variables on the measure's risk model. Note, the variables derived from these data are not included in the measure as specified

5. The American Community Survey (2009-2013): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score.

#### Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

Suter LG, Parzynski CS, Grady JN, et al. 2014 Procedure Specific Complication Measure Updates and Specifications Report: Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) Risk-Standardized Complication Measure (Version 3.0). 2014

No data collection instrument provided Attachment NQF\_1550\_HipKnee\_Complication\_Data\_Dictionary\_v1.0.xlsx

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care,

outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES composite index score.

4. Data sources for the all-payer update:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS patients aged 65 years or over (65+) in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2009, there were 3,193,904 adult discharges from 446 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the pneumonia mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0468\_Pneumonia\_Mortality\_Data\_Dictionary\_09-26-17\_v1.0.xls

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES

composite index score.

4. Data sources for the all-payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California, we performed analyses to determine whether the COPD mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_1893\_COPD\_Mortality\_NQF\_Data\_Dictionary\_v1.0\_091818\_kl.xlsx

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Claims Data sources for the Medicare FFS measure:

Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score.

Data sources for the all-payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California, we performed analyses to determine whether the HF readmission measure can be applied to all adult patients, including not only FFS Medicare

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patients aged 65 years or older, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_2558\_CABG\_Mortality\_Data\_Dictionary\_12-30-16\_v1.0.xlsx

#### Level

#### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Facility

### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Facility, Integrated Delivery System

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Facility

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Facility

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Facility

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Facility

#### Setting

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Inpatient/Hospital, Outpatient Services

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Inpatient/Hospital

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Inpatient/Hospital

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Inpatient/Hospital

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Inpatient/Hospital

#### Numerator Statement

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The outcome for the HWR measure is 30-day readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions, within 30 days from the date of discharge from an eligible index admission. If a patient has more than one unplanned admission (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. The measure looks for a dichotomous yes or no outcome of whether each admitted patient has an unplanned readmission within 30 days. However, if the first readmission after discharge is considered planned, any subsequent unplanned readmission is not counted as an outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission.

The outcome for the ACR measure is also 30-day readmission. The outcome is defined identically to what is described above for the HWR measure.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The outcome for this measure is any complication occurring during the index admission (not coded present on arrival) to 90 days post-date of the index admission. Complications are counted in the measure only if they occur during the index hospital admission or during a readmission. The complication outcome is a dichotomous (yes/no) outcome. If a patient experiences one or more of these complications in the applicable time period, the complication outcome for that patient is counted in the measure as a "yes".

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia, or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary discharge diagnosis of severe sepsis.

Additional details are provided in S.5 Numerator Details.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with either a principal discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD.

Additional details are provided in S.5 Numerator Details.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The outcome for this measure is 30-day all-cause mortality. Mortality is defined as death for any reason within 30 days of the procedure date from the index admission for patients 18 and older discharged from the hospital after undergoing isolated CABG surgery.

#### Numerator Details

#### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of discharge of the index admission, excluding planned readmissions as defined below.

Planned Readmission Algorithm (Version 4.0)

The Planned Readmission Algorithm is a set of criteria for classifying readmissions as planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The Planned Readmission Algorithm has three fundamental principles:

1. A few specific, limited types of care are always considered planned (obstetric delivery, transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);

2. Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and

3. Admissions for acute illness or for complications of care are never planned.

The algorithm was developed in 2011 as part of the Hospital-Wide Readmission measure. In 2013, CMS applied the algorithm to its other readmission measures.

The Planned Readmission Algorithm and associated code tables are attached in data field S.2b (Data Dictionary or Code Table).

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The composite complication is a dichotomous outcome (yes for any complication(s); no for

no complications). Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes". Complications are counted in the measure only if they occur during the index hospital admission (and are not present on admission) or during a readmission.

The complications captured in the numerator are identified during the index admission OR associated with a readmission up to 90 days post-date of index admission, depending on the complication. The follow-up period for complications from date of index admission is as follows:

The follow-up period for AMI, pneumonia, and sepsis/septicemia/shock is seven days from the date of index admission because these conditions are more likely to be attributable to the procedure if they occur within the first week after the procedure. Additionally, analyses indicated a sharp decrease in the rate of these complications after seven days.

Death, surgical site bleeding, and pulmonary embolism are followed for 30 days following admission because clinical experts agree these complications are still likely attributable to the hospital performing the procedure during this period and rates for these complications remained elevated until roughly 30 days post admission.

The measure follow-up period is 90 days after admission for mechanical complications and periprosthetic joint infection/wound infection. Experts agree that mechanical complications and periprosthetic joint infection/wound infections due to the index THA/TKA occur up to 90 days following THA/TKA.

The measure counts all complications occurring during the index admission regardless of when they occur. For example, if a patient experiences an AMI on day 10 of the index admission, the measure will count the AMI as a complication, although the specified follow-up period for AMI is seven days. Clinical experts agree with this approach, as such complications likely represent the quality of care provided during the index admission.

As of 2014 reporting, the measure does not count complications in the complications outcome that are coded as POA during the index admission; this prevents identifying a condition as a complication of care if it was present on admission for the THA/TKA procedure.

For full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheet "Complication Codes ICD9-ICD10".

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA). Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for-service (FFS) beneficiaries and hospitalized in non-federal acute care hospitals.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Outcome definition

This measure counts death from any cause within 30 days of the index admission date.

Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and appropriate transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2018; Dharmarajan et al., 2015).

Identifying deaths in the Medicare FFS population

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Reference:

1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/QnetTi er3&cid=1163010421830. Accessed June 6, 2018.

2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

In the current publicly reported measure, we identify deaths for Medicare FFS patients 65 years or older in the Medicare Enrollment Database (EDB).

Outcome Attribution:

Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves a qualifying isolated CABG procedure is as follows:

1) If a patient undergoes a CABG procedure in the first hospital and is then transferred to a second hospital where there is no CABG procedure, the mortality outcome is attributed to the first hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: A transfer following CABG is most likely due to a complication of the index procedure and that care provided by the hospital performing the CABG procedure likely dominates mortality risk even among transferred patients.

2) If a patient is admitted to a first hospital but does not receive a CABG procedure there and is then transferred to a second hospital where a CABG is performed, the mortality outcome is attributed to the second hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: Care provided by the hospital performing the CABG procedure likely dominates mortality risk.

3) If a patient undergoes a CABG procedure in the first hospital and is transferred to a second hospital where another CABG procedure is performed, the mortality outcome is attributed to the first hospital performing the index (first) CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: A transfer following CABG is most likely due to a complication of the index procedure, and care provided by the hospital performing the index CABG procedure likely

dominates mortality risk even among transferred patients.

#### **Denominator Statement**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure at the hospital level includes admissions for Medicare beneficiaries who are 65 years and older and are discharged from all non-federal, acute care inpatient US hospitals (including territories) with a complete claims history for the 12 months prior to admission.

The measure at the ACO level includes all relevant admissions for ACO assigned beneficiaries who are 65 and older and are discharged from all non-Federal short-stay acute care hospitals, including critical access hospitals.

Additional details are provided in S.9 Denominator Details.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The target population for the publically reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing elective primary THA and/or TKA procedures.

Additional details are provided in S.9 Denominator Details.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients aged 18 years and older discharged from the hospital with a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA, and with a complete claims history for the 12 months prior to admission.

The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non-federal acute care hospitals.

Additional details are provided in S.7 Denominator Details.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients discharged from the hospital with either a principal discharge diagnosis of COPD, or a principal discharge diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD; and with a complete claims history for the 12 months prior to admission.

The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non-federal hospitals

Additional details are provided in S.7 Denominator Details.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients who receive a qualifying isolated CABG procedure (see the attached Data Dictionary) and with a complete claims history for the 12 months prior to admission. CMS publicly reports this measure for those patients 65 years or older who are Medicare FFS beneficiaries admitted to non-federal hospitals.

If a patient has more than one qualifying isolated CABG admission in a year, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

#### **Denominator Details**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

2. Aged between 50 and 94 years

The hybrid measure is intended for the Medicare FFS population but was tested in a limited

dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.

3. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

4. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal

6. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

8. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting

the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure; the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

To be included in the hospital level measure, cohort patients must be:

1. Enrolled in Medicare fee-for-service (FFS) Part A for the 12 months prior to the date of admission and during the index admission;

- 2. Aged 65 or over;
- 3. Discharged alive from a non-federal short-term acute care hospital; and

4. Not transferred to another acute care facility.

The ACO version of this measure has the additional criterion that only hospitalizations for ACO-assigned beneficiaries that meet all of the other criteria listed above are included. The cohort definition is otherwise identical to that of the HWR described below.

The measure aggregates the ICD-9 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the AHRQ CCS. There are a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of five mutually exclusive specialty cohorts: surgery/gynecology, cardiorespiratory, cardiovascular, neurology, and medicine. The rationale behind this organization is that conditions typically cared for by the same team of clinicians are expected to experience similar added (or reduced) levels of readmission risk.

The measure first assigns admissions with qualifying AHRQ procedure categories to the Surgery/Gynecology Cohort. This cohort includes admissions likely cared for by surgical or gynecological teams.

The measure then sorts admissions into one of the four remaining specialty cohorts based on the AHRQ diagnosis category of the principal discharge diagnosis:

The Cardiorespiratory Cohort includes several condition categories with very high readmission rates such as pneumonia, chronic obstructive pulmonary disease, and heart failure. These admissions are combined into a single cohort because they are often clinically indistinguishable and patients are often simultaneously treated for several of these diagnoses.

The Cardiovascular Cohort includes condition categories such as acute myocardial infarction that in large hospitals might be cared for by a separate cardiac or cardiovascular team.

The Neurology Cohort includes neurologic condition categories such as stroke that in large hospitals might be cared for by a separate neurology team.

The Medicine Cohort includes all non-surgical patients who were not assigned to any of the other cohorts.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the specialty cohorts are attached in data field S.2b (Data Dictionary or Code Table).

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission;

2. Aged 65 or older

3. Having a qualifying elective primary THA/TKA procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following:

• Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field

of the index admission

• Partial hip arthroplasty (PHA) procedures (with a concurrent THA/TKA); partial knee arthroplasty procedures are not distinguished by ICD9 codes and are currently captured by the THA/TKA measure

- Revision procedures with a concurrent THA/TKA
- Resurfacing procedures with a concurrent THA/TKA
- Mechanical complication coded in the principal discharge

• Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field

- Removal of implanted devises/prostheses
- Transfer status from another acute care facility for the THA/TKA

Patients are eligible for inclusion in the denominator if they had an elective primary THA and/or a TKA AND had continuous enrollment in Part A and Part B Medicare fee-for-service (FFS) 12 months prior to the date of index admission.

This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years (see Section 2b4.11 of the Testing Attachment for details, 2b4.11).

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each measure are:

ICD-9-CM codes used to define a THA or TKA:

81.51 Total Hip Replacement

81.54 Total Knee Replacement

ICD-10 Codes that define a THA or TKA:

OSR90J9 Replacement of Right Hip Joint with Synthetic Substitute, Cemented, Open Approach

OSR90JA Replacement of Right Hip Joint with Synthetic Substitute, Uncemented, Open Approach

OSR90JZ Replacement of Right Hip Joint with Synthetic Substitute, Open Approach

OSRBOJ9 Replacement of Left Hip Joint with Synthetic Substitute, Cemented, Open Approach

OSRBOJA Replacement of Left Hip Joint with Synthetic Substitute, Uncemented, Open Approach

OSRBOJZReplacement of Left Hip Joint with Synthetic Substitute, Open Approach

OSRC07Z Replacement of Right Knee Joint with Autologous Tissue Substitute, Open Approach

OSRCOJZReplacement of Right Knee Joint with Synthetic Substitute, Open Approach

OSRCOKZ Replacement of Right Knee Joint with Nonautologous Tissue Substitute, Open Approach

OSRD07Z Replacement of Left Knee Joint with Autologous Tissue Substitute, Open Approach OSRD0JZ Replacement of Left Knee Joint with Synthetic Substitute, Open Approach OSRD0KZReplacement of Left Knee Joint with Nonautologous Tissue Substitute, Open Approach

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OSRT07Z Replacement of Right Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

OSRTOJZ Replacement of Right Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

OSRTOKZ Replacement of Right Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

OSRU07Z Replacement of Left Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

OSRU0JZ Replacement of Left Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

OSRUOKZ Replacement of Left Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

OSRV07Z Replacement of Right Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

OSRVOJZ Replacement of Right Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

OSRVOKZ Replacement of Right Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach

OSRW07Z Replacement of Left Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

OSRWOJZ Replacement of Left Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

OSRWOKZ Replacement of Left Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach

An ICD-9 to ICD-10 crosswalk is attached in field S.2b. (Data Dictionary or Code Table).

Elective primary THA/TKA procedures are defined as those procedures without any of the following:

1) Femur, hip, or pelvic fractures coded in principal or secondary discharge diagnosis fields of the index admission

2) Partial hip arthroplasty (PHA) procedures with a concurrent THA/TKA

3) Revision procedures with a concurrent THA/TKA

4) Resurfacing procedures with a concurrent THA/TKA

5) Mechanical complication coded in the principal discharge

6) Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field

7) Removal of implanted devises/prostheses

8) Transfer status from another acute care facility for the THA/TKA

For a full list of ICD-9 and ICD-10 codes defining the following see attached Data Dictionary, sheet "THA TKA Cohort Codes Part 2."

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria:

1. Have a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or

sepsis (not including severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission;

3. Aged 65 or over; and

4. Not transferred from another acute care facility

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria:

1. Have principal discharge diagnosis of COPD or principal discharge diagnosis of respiratory failure with a secondary diagnosis of COPD with exacerbation;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission, beneficiaries;

3. Aged 65 or over; and

4. Not transferred from another acute care facility.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure included index admissions for patients:

1. Having a qualifying isolated CABG surgery during the index admission;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of the index admission, and enrolled in Part A during the index admission; and,

3. Aged 65 or over.

Isolated CABG surgeries are defined as those CABG procedures performed without the following concomitant valve or other major cardiac, vascular, or thoracic procedures:

o Valve procedures;

o Atrial and/or ventricular septal defects;

- o Congenital anomalies;
- o Other open cardiac procedures;
- o Heart transplants;
- o Aorta or other non-cardiac arterial bypass procedures;
- o Head, neck, intracranial vascular procedures; or,

o Other chest and thoracic procedures

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9) codes as well as International Classification of Disease, 10th Revision (ICD-10) codes used to define the cohort are listed in the attached Data Dictionary.

#### Exclusions

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;

2. Discharged against medical advice (AMA);

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure excludes index admissions for patients:

- 1. Admitted to Prospective Payment System (PPS)-exempt cancer hospitals;
- 2. Without at least 30 days post-discharge enrollment in FFS Medicare;
- Discharged against medical advice (AMA);
- 4. Admitted for primary psychiatric diagnoses;
- 5. Admitted for rehabilitation; or
- 6. Admitted for medical treatment of cancer.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure excludes index admissions for patients:

- 1. Without at least 90 days post-discharge enrollment in FFS Medicare;
- 2. Who were discharged against medical advice (AMA); or,
- 3. Who had more than two THA/TKA procedure codes during the index hospitalization.

After applying these exclusion criteria, we randomly select one index admission for patients with multiple index admissions in a calendar year. We therefore exclude the other eligible index admissions in that year.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This mortality measure excludes index admissions for patients:

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;

2. With inconsistent or unknown vital status or other unreliable demographic (age and

gender) data;

3. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or,

4. Discharged against medical advice.

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

#### 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

2. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or

3. Discharged against medical advice

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.

Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The CABG surgery mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; or,

2. Discharged against medical advice (AMA).

For patients with more than one qualifying CABG surgery admission in the measurement period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

### **Exclusion Details**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.

Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the

patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1. Admitted to a PPS-exempt cancer hospital, identified by the Medicare provider ID.

2. Admissions without at least 30 days post-discharge enrollment in FFS Medicare are determined using data captured in the Medicare Enrollment Database (EDB).

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in claims data.

4. Admitted for primary psychiatric disease, identified by a principal diagnosis in one of the specific AHRQ CCS categories listed in the attached data dictionary.

5. Admitted for rehabilitation care, identified by the specific ICD-9 diagnosis codes included in CCS 254 (Rehabilitation care; fitting of prostheses; and adjustment of devices).

6. Admitted for medical treatment of cancer, identified by the specific AHRQ CCS categories listed in the attached data dictionary.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure excludes index admissions for patients:

1. Without at least 90 days post-discharge enrollment in FFS Medicare

Rationale: The 90-day complication outcome cannot be assessed in this group since claims data are used to determine whether a complication of care occurred.

2. Who were discharged against medical advice (AMA); or,

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. Who had more than two THA/TKA procedure codes during the index hospitalization

Rationale: Although clinically possible, it is highly unlikely that patients would receive more than two elective THA/TKA procedures in one hospitalization, which may reflect a coding error.

### 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

1. Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years; 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male' or 'female'.

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice enrollment data.

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator.

After exclusions #1-3 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

Individual codes with descriptors can be found in the attached Data Dictionary.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

1. Inconsistent vital status or unreliable demographic data in the claims

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database. Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse outcome or signal of poor quality care.

2. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in the claim.

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

Individual codes with descriptors can be found in the attached Data Dictionary.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The CABG surgery mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data.

Rationale: We do not include stays for patients where the age (indicated in the claim) is greater than 115, where the gender (indicated in the claim) is neither male nor female, where the admission date (indicated in the claim) is after the date of death in the Medicare Enrollment Database, or where the date of death (in the Medicare Enrollment Database) occurs before the date of discharge but the patient was discharged alive (indicated in the claim).

2. Discharged against medical advice (AMA).

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. This information is taken from the discharge disposition in the claim.

3. With more than one qualifying CABG surgery admission in the measurement period.

Rationale: CABG procedures are expected to last for several years without the need for revision or repeat revascularization. A repeat CABG procedure during the measurement period likely represents a complication of the original CABG procedure and is a clinically more complex and higher risk surgery. Therefore, we select the first CABG surgery admission for inclusion in the measure and exclude subsequent CABG surgery admissions (additional claims indicating a CABG procedure was performed within 30-days of the index CABG procedure) from the cohort.

#### Risk Adjustment

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Statistical risk model

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Statistical risk model

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Statistical risk model

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Statistical risk model

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Statistical risk model

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Statistical risk model

#### Stratification

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

N/A

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

N/A

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

N/A

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

N/A

- 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization N/A
- 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

N/A

#### Type Score

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Rate/proportion better quality = lower score

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Rate/proportion better quality = lower score

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Rate/proportion better quality = lower score

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Rate/proportion better quality = lower score

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Rate/proportion better quality = lower score

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Rate/proportion better quality = lower score

#### Algorithm

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

This measure estimates a hospital-level 30-day all-cause RSRR using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient, and hospital levels to account for variance in patient outcomes within and between hospitals (Normand et al., 2007). At the patient level, it models the log-odds of readmission within 30 days of discharge using age, selected clinical covariates, and a hospital -specific effect. At the hospital level, the approach models the hospital- specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of a readmission, after accounting for patient risk. The hospital-specific effects are given a distribution to account for the clustering (non-independence) of patients within the same hospital (Normand et al., 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals.

Admissions are assigned to one of five mutually exclusive specialty cohort groups consisting of related conditions or procedures. For each specialty cohort group, the standardized readmission ratio (SRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case mix and service mix, and the denominator is the number of readmissions expected based on the nation's performance with that hospital's case mix and service mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected readmission rates or worse quality.

For each specialty cohort, the "predicted" number of readmissions (the numerator) is calculated by using the coefficients estimated by regressing the risk factors (found in Table D.9) and the hospital-specific effect on the risk of readmission. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of readmissions (the denominator) is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the data in that period.

The specialty cohort SRRs are then pooled for each hospital using a volume-weighted geometric mean to create a hospital-wide composite SRR. The composite SRR is multiplied by the national observed readmission rate to produce the RSRR. The statistical modeling approach is described fully in Appendix A and in the original methodology report (Horwitz et al., 2012).

The ACR quality measure was adapted from the HWR quality measure. The unit of analysis was changed from the hospital to the ACO. This was possible because both the HWR and ACR measures assess readmission performance for a population that clusters patients together (either in hospitals or in ACOs). The goal is to isolate the effects of beneficiary characteristics on the probability that a patient will be readmitted from the effects of being in a specific

hospital or ACO. In addition, planned readmissions are excluded for the ACR quality measure in the same way that they are excluded for the HWR measure. The ACR measure is calculated identically to what is described above for the HWR measure.

References:

Horwitz L, Partovian C, Lin Z, et al. Hospital-Wide All-Cause Unplanned Readmission Measure: Final Technical Report. 2012;

http://www.qualitynet.org/dcs/BlobServer?blobkey=id&blobnocache=true&blobwhere=122 8889825199&blobheader=multipart%2Foctet-stream&blobheadername1=Content-Disposition&blobheadervalue1=attachment%3Bfilename%3DDryRun\_HWR\_TechReport\_081 012.pdf&blobcol=urldata&blobtable=MungoBlobs. Accessed 30 April, 2014.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The measure estimates hospital-level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of a complication occurring within 90 days of the index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a complication at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given hospital, multiplied by the national observed complication rate. For each hospital, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of complications expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected complication rates or better quality, and a higher ratio indicates higher-than-expected complication rates or worse quality.

The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of having an admission with a complication. The estimated hospital-specific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of admissions with a complication (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific effect. The results are log transformed and summed over all patients in the hospital to get an expected value.

To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed complication rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2012).

References:

Grosso L, Curtis J, Geary L, et al. Hospital-level Risk-Standardized Complication Rate Following Elective Primary Total Hip Arthroplasty (THA) And/Or Total Knee Arthroplasty (TKA) Measure Methodology Report. 2012.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for pneumonia using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are log transformed and summed over all patients in the hospital to get a predicted value to get a nexpected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005).

References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for COPD using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are log transformed and summed over all patients in the hospital to get a predicted value. The model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005).

References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure estimates hospital-level 30-day all-cause RSMRs for CABG surgery using a hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of the procedure date using age, sex, selected clinical covariates, and a hospital-specific effect. At the hospital level, the approach models the hospital-specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific effects are given a distribution to account for the clustering (non-independence) of patients within the same hospital (Normand and Shahian, 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix, to be compared to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are log transformed and summed over all patients during over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Suter et al. 2012).

#### Reference:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Suter L, Wang C, Araas M, et al. Hospital-Level 30-day All-Cause Mortality Following

Coronary

Artery Bypass Graft Surgery; Updated Measure Methodology Report. 2012

#### Submission items

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital-wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement conditionand procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer, whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include as many have survival as their primary goal, however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into in order to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of inhospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value: There are no competing NQFendorsed measures.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

5.1 Identified measures: 1768 : Plan All-Cause Readmissions (PCR)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0695 : Hospital 30-Day Risk-Standardized Readmission Rates following Percutaneous Coronary Intervention (PCI)

0329 : Risk-Adjusted 30-Day All-Cause Readmission Rate

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: This measure and the National Committee for Quality Assurance (NCQA) Plan All-Cause Readmissions (PCR) Measure #1768 are related measures, but are not competing because they don't have the same measure focus and same target population. In addition, both have been previously harmonized to the extent possible under the guidance of the National Quality Forum Steering Committee in 2011. Each of these measures has different specifications. NCQA's Measure #1768 counts the number of inpatient stays for patients aged 18 and older during a measurement year that were followed by an acute readmission for any diagnosis to any hospital within 30 days. It contrasts this count with a calculation of the predicted probability of an acute readmission. NCQA's measure is intended for quality monitoring and accountability at the health plan level. This measure estimates the risk-standardized rate of unplanned, all-cause readmissions to a hospital or ACO for any eligible condition within 30 days of hospital discharge for patients aged 18 and older. The measure will result in a single summary risk-adjusted readmission rate for conditions or procedures that fall under five specialties: surgery/gynecology, general medicine, cardiorespiratory, cardiovascular, and neurology. This measure is specified for evaluating hospital or ACO performance. However, despite these differences in cohort specifications, both measures under NQF guidance have been harmonized to the extent possible through modifications such as exclusion of planned readmissions. We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

5.1 Identified measures: 0534 : Hospital specific risk-adjusted measure of mortality or one or more major complications within 30 days of a lower extremity bypass (LEB).

0564 : Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

2052 : Reduction of Complications through the use of Cystoscopy during Surgery for Stress Urinary Incontinence

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome measures (for example, process measures) with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

5.1 Identified measures: 0708 : Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window)

0231 : Pneumonia Mortality Rate (IQI #20)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0279 : Community Acquired Pneumonia Admission Rate (PQI 11)

2579 : Hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia (PN)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: The pneumonia mortality measure cohort, version 9.0, is harmonized with the hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia cohort. Version 9.2 of the pneumonia mortality measure cohort is, however, not harmonized with the pneumonia payment measure cohort. There is intention to harmonize the pneumonia mortality and payment measure cohorts in the future. We did not include in our list of related measures any non-outcome (for example, process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Lastly,

this measure and the NQF Inpatient Pneumonia Mortality (AHRQ) Measure #0231 are complementary rather than competing measures. Although they both assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of pneumonia, the specified outcomes are different. This measure assesses 30-day mortality while #0231 assesses inpatient mortality. Assessment of 30-day and inpatient mortality outcomes have distinct advantages and uses which make them complementary as opposed to competing. For example the 30-day period provides a broader perspective on hospital care and utilizes standard time period to examine hospital performance to avoid bias by differences in length of stay among hospitals. However, in some settings it may not be feasible to capture postdischarge mortality making the inpatient measure more useable. We have previously consulted with AHRQ to examine harmonization of complementary measures of mortality for patients with AMI and stroke. We have found that the measures are harmonized to the extent possible given that small differences in cohort inclusion and exclusion criteria are warranted on the basis of the use of different outcomes. However, this current measure has been modified from the last endorsed version to include patients with a principal discharge diagnosis of sepsis and a secondary discharge diagnosis of pneumonia that is present on admission. The cohort was also expanded to include patients with a principal discharge diagnosis of aspiration pneumonia. Thus the current measure cohort is no longer harmonized with measure #0231.

5b.1 If competing, why superior or rationale for additive value: N/A

### 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

5.1 Identified measures: 0701 : Functional Capacity in COPD patients before and after Pulmonary Rehabilitation

0700 : Health-related Quality of Life in COPD patients before and after Pulmonary Rehabilitation

0275 : Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate (PQI 05)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (for example, process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. Additionally, the measure, with the specified cohort, has been publicly reported since December 2014. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

5.1 Identified measures: 0114 : Risk-Adjusted Postoperative Renal Failure

0115 : Risk-Adjusted Surgical Re-exploration

0119 : Risk-Adjusted Operative Mortality for CABG

0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery

0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery

0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)

0130 : Risk-Adjusted Deep Sternal Wound Infection

0131 : Risk-Adjusted Stroke/Cerebrovascular Accident

0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0535 : 30-day all-cause risk-standardized mortality rate following percutaneous coronary intervention (PCI) for patients without ST segment elevation myocardial infarction (STEMI) and without cardiogenic shock

0536 : 30-day all-cause risk-standardized mortality rate following Percutaneous Coronary Intervention (PCI) for patients with ST segment elevation myocardial infarction (STEMI) or cardiogenic shock

1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

2515 : Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. In addition, the related claims-based CABG readmission measure, which utilizes the same definition of isolated CABG as the mortality measure, was validated using STS clinical registry data. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related nonoutcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: The NQF-endorsed STS measure that has the same target population and similar measure focus as the proposed CABG mortality measure is the Risk-adjusted operative mortality for CABG (NQF #0119). The

measure steward for the registry-based mortality measure for CABG is STS. In developing the measure, we sought to harmonize with the STS measure to the greatest extent feasible given competing measure design objectives and differences in the data source. The potential sources of discrepancy are target patient population, age, isolated CABG, period of observation, and included hospitals. The STS measure also assesses both deaths occurring during CABG hospitalization (in-hospital death, even if after 30 days) and deaths occurring within 30 days of procedure date. As indicated above, the proposed measure uses a standard follow-up period of 30 days of procedure date in order to measure each patient consistently. The proposed claims-based measure has been tested and is appropriate for use in all-payer data for patients 18 years and over. Finally, the STS cardiac surgery registry currently enrolls most, but not all, patients receiving CABG surgeries in the U.S. The proposed CABG mortality measure will capture all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry.

# Comparison of NQF 3502, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530 continued...

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

0530 Mortality for Selected Conditions

### Steward

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Centers for Medicare & Medicaid Services (CMS)

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Centers for Medicare & Medicaid Services (CMS)

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Centers for Medicare & Medicaid Services

2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Centers for Medicare & Medicaid Services (CMS)

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Agency for Healthcare Research and Quality

### **0530 Mortality for Selected Conditions**

Agency for Healthcare Research and Quality

### Description

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently

endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.

b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

- 2. Age of patients in cohort:
- a. The claims-only measure includes Medicare FFS patients, age 65-94.
- b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

4. Socioeconomic risk factor analyses

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

5. Exclusion analyses

a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.

6. Meaningful differences

a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
- a. The claims-only measure uses administrative claims data only for risk adjustment

b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI). Mortality is defined as death from any cause within 30 days after the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually

reports the measure for patients who are 65 years and older and are Medicare fee-forservice (FFS) beneficiaries hospitalized in non-federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR). Mortality is defined as death for any cause within 30 days after the admission date for the index admission, for patients 18 and older discharged from the hospital with a principal diagnosis of heart failure (HF). The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for-service (FFS) beneficiaries and hospitalized in non-federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.

### 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

This stroke mortality measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a newly developed measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

In-hospital deaths per 1,000 discharges for low mortality (< 0.5%) Diagnosis Related Groups (DRGs) among patients ages 18 years and older or obstetric patients. Excludes cases with trauma, cases with cancer, cases with an immunocompromised state, and transfers to an acute care facility.

[NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]

#### **0530 Mortality for Selected Conditions**

A composite measure of in-hospital mortality indicators for selected conditions.

### Туре

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Outcome

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Outcome

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Outcome

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Outcome
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Outcome

**0530 Mortality for Selected Conditions** 

Composite

### Data Source

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Claims, Electronic Health Records, Other Clinical-Hybrid Dataset

Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).

The two data sources listed below were used for testing the claims-based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).

HWM claims-only datasets:

Medicare Part A Inpatient Claims Data

The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.

Medicare Enrollment Database (EDB)

This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

No data collection instrument provided Attachment Del18b2HOP5HWMHybridDataDictionary01072019.xlsx

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient

hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. Veterans Health Administration Data: This data source contains claims data for VA inpatient and outpatient services including: inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission.

All-payer data sources:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the AMI mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission.

**References:** 

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0230\_AMI\_Mortality\_Data\_Dictionary\_Final-636973300643762106.xlsx

### 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to

obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. Veterans Health Administration (VA) Data: This data source contains claims data for VA inpatient and outpatient services including: inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission.

All-payer data sources:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the HF mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0229\_S2b\_HF\_Mortality\_Data\_Dictionary\_v1.0\_Final-636973301131111819.xlsx

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

Claims (Only), Other, Registry For measure implementation the data sources will be:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission, as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. For measure development purposes only, we linked the data sources above with data from the AHA/ASA GWTG-Stroke Registry. The registry data were used to obtain the National Institutes of Health (NIH) Stroke Scale scores and clinical risk variables. When this

#### **PAGE 263**

measure is implemented NIH Stroke Scale scores will be derived from ICD-10 codes in Medicare claims.

Reference:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91. Data sources for the all-payer update

No data collection instrument provided Attachment NQF\_2876\_Claims-Only\_Stroke\_Mortality\_S2b\_Mortality\_Data\_Dictionary\_v1.0-635884757617681755.xlsx

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Claims While the measure is tested and specified using data from the Healthcare Cost and Utilization Project (HCUP) (see section 1.1 and 1.2 of the measure testing form), the measure specifications and software are specified to be used with any ICD-9-CM-coded administrative billing/claims/discharge dataset with Present on Admission (POA) information. Note that in Version 5.0 (April 2015), the AHRQ QI software will no longer support prediction of POA status using an embedded prediction module. Users are expected to provide POA data.

Available at measure-specific web page URL identified in S.1 Attachment PSI\_02\_Death\_Rate\_in\_Low-Mortality\_Diagnosis\_Related\_Groups\_-DRGs-\_-\_Editable.xlsx

#### **0530 Mortality for Selected Conditions**

Electronic administrative data/claims

### Level

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Facility

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Facility

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Facility

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Facility
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Facility

#### **0530 Mortality for Selected Conditions**

Facility/Agency

### Setting

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Inpatient/Hospital

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Inpatient/Hospital, Other Hospital & amp; Hospital: Acute Care Facility

2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Hospital

0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Inpatient/Hospital

### **0530 Mortality for Selected Conditions**

Hospital

### Numerator Statement

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days from the date of admission for patients discharged from the hospital with a principal diagnosis of AMI.

Additional details are provided in S.5 Numerator Details.

### 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients 65 and older discharged from the hospital with a principal diagnosis of HF.

Additional details are provided in S.5 Numerator Details.

### 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for patients with a principal discharge diagnosis of acute ischemic stroke.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

### **0530 Mortality for Selected Conditions**

Number of in-hospital deaths

### Numerator Details

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

### Outcome definition

This measure counts death from any cause within 30 days after the index admission date.

Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality. (Simoes et al., 2018; Dharmarajan et al., 2015).

Identifying deaths in the Medicare FFS population

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer population

For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI). Reference:

1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet Tier3&cid=1163010421830. Accessed May 4, 2018.

### 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

**Outcome Definition** 

The measure counts deaths for any cause within 30 days of the date of admission of the index HF hospitalization.

Rationale: From a patient perspective, death is a critical outcome regardless of cause. Outcomes occurring within 30 days of the start of the admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2017; Dharmarajan et al., 2015).

Identifying deaths in the FFS measure

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer measure

For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI).

### Reference:

1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet Tier3&cid=1163010421830. Accessed June 7, 2017.

2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure outcome is death from any cause within 30 days of the index admission date. As currently specified, we identify deaths for FFS Medicare patients, age 65 years and older, in the Medicare Enrollment Database (EDB).

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Not applicable

#### **0530 Mortality for Selected Conditions**

Number of in-hospital deaths for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI

hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

#### **Denominator Statement**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7

Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients discharged from the hospital with a principal discharge diagnosis of AMI and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.

Additional details are provided in S.7 Denominator Details.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have explicitly tested the measure in both age groups.

The cohort for the publically reported measure includes admissions for patients aged 65 years and older discharged from the hospital with a principal discharge diagnosis of HF and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.

Additional details are provided in S.7 Denominator Details.

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The cohort includes inpatient admissions to all non-federal, short-term, acute care hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

Additional details are provided in S.9 Denominator Details.

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Discharges, for patients ages 18 years and older or MDC 14 (pregnancy, childbirth, and puerperium), with a low-mortality (less than 0.5% mortality) MS-DRG code (LOWMODR). If an MS-DRG is divided into "without/with (major) complications and comorbidities," both codes without complications/comorbidities and codes with (major) complications/comorbidities must have mortality rates below 0.5% in the reference population to qualify for inclusion.

#### **0530 Mortality for Selected Conditions**

Number of eligible discharges (all indicators are limited to the adult population)

### Denominator Details

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

2. Aged between 50 and 94 years

The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.

3. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

4. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal

6. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

8. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Having a principal discharge diagnosis of AMI;

2. Enrolled in Medicare FFS Part A and Part B for the first 12 months prior to the date of admission, enrolled in Part A during the index admission, or those who are VA beneficiaries;

3. Aged 65 or over; and

4. Not transferred from another acute care facility.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

To be included in the HF measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Have a principal discharge diagnosis of heart failure (HF);

2. Enrolled in Medicare Fee-For-Service (FFS)Part A and Part B for the 12 months prior to the date of the index admission and Part A during the index admission, or those who are VA beneficiaries (in the cases of the AMI, HF, and pneumonia measures);

3. Aged 65 or over; and,

4. Not transferred from another acute care facility.

VA beneficiaries are eligible for inclusion in the AMI, HF, and pneumonia measure cohorts regardless of Medicare FFS enrollment or whether they were hospitalized in a VA or non-VA short-term acute care hospital.

This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The denominator includes all Medicare FFS beneficiaries, age 65 and over, with a principal discharge diagnosis of acute ischemic stroke. To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Enrolled in Medicare fee-for-service (FFS) during the index admission;

2. Not transferred from another acute care facility; and

3. Enrolled in Part A and Part B Medicare for the 12 months prior to the date of index admission.

ICD-9-CM codes that define the patient cohort:

433.01 Occlusion and stenosis of basilar artery with cerebral infarction

433.11 Occlusion and stenosis of carotid artery with cerebral infarction

433.21 Occlusion and stenosis of vertebral artery with cerebral infarction

433.31 Occlusion and stenosis of multiple and bilateral precerebral arteries with cerebral infarction

433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction

433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral infarction

434.01 Cerebral thrombosis with cerebral infarction

434.11 Cerebral embolism with cerebral infarction

434.91 Cerebral artery occlusion, unspecified with cerebral infarction

436 Acute, but ill-defined, cerebrovascular disease

ICD-10 codes that define the patient cohort:

163.22 Cerebral infarction due to unspecified occlusion or stenosis of basilar arteries

163.139 Cerebral infarction due to embolism of unspecified carotid artery

I63.239 Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries

163.019 Cerebral infarction due to thrombosis of unspecified vertebral artery

163.119 Cerebral infarction due to embolism of unspecified vertebral artery

I63.219 Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries

163.59 Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery

163.20 Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries

163.30 Cerebral infarction due to thrombosis of unspecified cerebral artery

163.40 Cerebral infarction due to embolism of unspecified cerebral artery

I63.50 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery

167.8 Other specified cerebrovascular diseases

167.89 Other cerebrovascular diseases

An ICD-9 to ICD-10 crosswalk is attached in field S.2b. (Data Dictionary or Code Table).

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

LOWMODR: Low-mortality (less than 0.5%) MS-DRG codes

(See attached technical specifications for detailed list of codes.)

#### **0530 Mortality for Selected Conditions**

Number of eligible adult discharges for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI

hemorrhage (separately).

See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

### **Exclusions**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;

Discharged against medical advice (AMA);

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The mortality measure excludes index hospitalizations that meet any of the following exclusion criteria:

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;

2. Inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission, or

4. Discharged against medical advice (AMA).

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The HF mortality measure excludes index hospitalizations that meet any of the following exclusion criteria:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

2. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission; or,

3. Discharged against medical advice.

4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility; or

5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission.

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure excludes admissions for patients:

1. With inconsistent or unknown vital status or other unreliable data;

2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission; and

3. Discharged against medical advice (AMA).

For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Exclude cases:

- with any listed ICD-10-CM diagnosis codes for trauma (Appendix G: TRAUMID)
- with any listed ICD-10-CM diagnosis codes for cancer (Appendix H: CANCEID)

• with any listed ICD-10-CM diagnosis codes for immunocompromised state (Appendix I: IMMUNID)

• with any listed ICD-10-PCS procedure codes for immunocompromised state (Appendix I: IMMUNIP)

transfer to an acute care facility (DISP=2)

 with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing)

### **0530 Mortality for Selected Conditions**

Indicator specific

### **Exclusion Details**

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.

Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility. Discharges are identified using data from the claims.

Rationale: It is unlikely that these patients had clinically significant AMI.

2. Inconsistent or unknown vital status or other unreliable demographic data

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database.

Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse outcome or signal of poor quality care.

4. Discharged against medical advice. Discharge status is identified using the claims

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

After exclusions #1-4 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent.

For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. July admissions are excluded to avoid assigning a single death to two admissions.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

1. Inconsistent or unknown vital status or other unreliable demographic data

Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male'

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

2. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission

Rationale: Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient standard analytic file (SAF). This exclusion applies when the measure is used in Medicare FFS patients only.

Rationale: These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care.

3. Discharged against medical advice

Discharges against medical advice are identified using the discharge disposition indicator.

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility. The discharge disposition indicator is used to identify patients alive at discharge. Transfers are identified in the claims when a patient with a qualifying admission is discharged from an acute care hospital and admitted to another acute care hospital on the same day or next day.

Rationale: It is unlikely that these patients had clinically significant HF.

5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission

Patients with LVAD implantation or heart transplantation during an index admission or in the previous 12 months are identified by the corresponding codes for these procedures included in claims data.

Rationale: These patients represent a clinically distinct group (ICD-10-PCS code list).

The data sources for these analyses are Medicare administrative claims and enrollment information for patients with hospitalizations between July 1, 2013 and June 30, 2016.

After exclusions #1-5 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

1. Inconsistent vital status or unreliable data: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient Standard Analytic File (SAF). These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care for these patients.

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator. After all exclusions are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. For each patient, the probability of death increases with each subsequent admission, and therefore, the episodes of care are not mutually independent. Similarly, for the three year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Appendix G: Trauma Diagnosis Codes

Appendix H: Cancer Diagnosis Codes

Appendix I: Immunocompromised State Diagnosis and Procedure Codes

(See attached Appendix G, Appendix H, and Appendix I for detailed list of codes.)

### **0530 Mortality for Selected Conditions**

See Inpatient Quality Indicators: Technical Specifications for additional details (available at http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

### Risk Adjustment

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Statistical risk model

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Statistical risk model

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Statistical risk model

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Statistical risk model
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

No risk adjustment or risk stratification

### **0530 Mortality for Selected Conditions**

No risk adjustment or risk stratification

### Stratification

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

N/A

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

N/A

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

N/A

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity N/A
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Not applicable

**0530 Mortality for Selected Conditions** 

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### Type Score

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Rate/proportion better quality = lower score

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Rate/proportion better quality = lower score

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Rate/proportion better quality = lower score

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Rate/proportion better quality = lower score
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02) Rate/proportion better quality = lower score

#### **0530 Mortality for Selected Conditions**

### Algorithm

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a

predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse varianceweighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for AMI using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of discharge using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths, multiplied by the national unadjusted mortality rate. For each hospital, the numerator of the ratio ("predicted") is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator ("expected") is the number of deaths expected on the basis of the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower- than-expected mortality or better quality and a higher ratio indicates higher-than-expected mortality or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log

transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital specific intercept. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005).

#### References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology. 2005.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for HF using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the

hospital-specific intercept. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

### 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure estimates hospital-level, 30-day, all-cause RSMRs following hospitalization for stroke using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

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This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2011). References:

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Risk adjustment is not currently included in the ICD-10-CM/PCS v2018 of the AHRQ QI specifications, due to the transition to ICD-10-CM/PCS (October 1, 2015). At least one full year of data coded in ICD-10-CM/PCS is needed in order to develop robust risk adjustment models. A full year of ICD-10-CM/PCS coded all-payer data will not be available until mid-2019. AHRQ will announce an anticipated date as soon as one is known.

### 0530 Mortality for Selected Conditions

### Submission items

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital-wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer, whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include as many have survival as their primary goal, however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into in order to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to

patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value: There are no competing NQF-endorsed measures.

### 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

5.1 Identified measures: 2431 : Hospital-level, risk-standardized payment associated with a 30-day episode-of-care for Acute Myocardial Infarction (AMI)

1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts. Additionally, the measure, with the specified cohort, has been publicly reported since 2008. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they

typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

5.1 Identified measures: 0358 : Heart Failure Mortality Rate (IQI 16)

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. Additionally, the measure, with the specified cohort, has been publicly reported since 2008. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

### 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

5.1 Identified measures: 0467 : Acute Stroke Mortality Rate (IQI 17)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (such as process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome

measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Additionally, this measure and the NQF endorsed Acute Stroke Mortality Rate (IQI 17) (AHRQ) Measure #0467 are complementary and related rather than competing measures. Although they both assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of acute ischemic stroke, the specified outcomes are different. Our measure assesses 30-day mortality, while #0467 assesses inpatient mortality. The 30-day mortality and inpatient mortality outcomes each have distinct advantages and uses, which make them complementary (and related) as opposed to competing. For example the 30-day period provides a broader perspective on hospital care and utilizes a standard time period to examine hospital performance to avoid bias by differences in length of stay among hospitals. However, in some settings it may not be feasible to capture post-discharge mortality, making the inpatient measure more useable. We have previously consulted with AHRQ to examine harmonization of the measures' cohort. As a result of that collaboration, we have found that the measures' cohorts are harmonized to the extent possible and that the small differences in cohort inclusion and exclusion criteria are appropriate because the measures assess different outcomes.

5b.1 If competing, why superior or rationale for additive value: This measure looks at a longer outcome time frame (30-days versus in-hospital) and incorporates stroke severity into the risk-model.

The current publicly reported measure, Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalization Measure, is a potentially competing measure. It is CMS intent to replace the current measure in any given program with this newly developed measure, which includes stroke severity in the risk model.

The Hybrid Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke with Risk Adjustment for Stroke Severity measure is also being submitted to NQF for endorsement. This measure uses a combination of claims and electronic health records (EHR) data for risk adjustment but is otherwise harmonized with the new claims-only measure. It is CMS intent to implement only one of the new stroke mortality measures (this claims-only measure or the hybrid measure) in any given program.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact: not applicable

5b.1 If competing, why superior or rationale for additive value: Not applicable

#### **0530 Mortality for Selected Conditions**

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact:

5b.1 If competing, why superior or rationale for additive value:

# Comparison of NQF 3504, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2867, 0347 and 0530

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

### Steward

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Centers for Medicare & Medicaid Services (CMS)

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Centers for Medicare & Medicaid Services (CMS)

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Centers for Medicare & Medicaid Services

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Centers for Medicare & Medicaid Services (CMS)

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Centers for Medicare & Medicaid Services

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Centers for Medicare & Medicaid Services

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Centers for Medicare & Medicaid Services (CMS)

### Description

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.

b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

- 2. Age of patients in cohort:
- a. The claims-only measure includes Medicare FFS patients, age 65-94.
- b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing
- a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

4. Socioeconomic risk factor analyses

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

5. Exclusion analyses

a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.

6. Meaningful differences

a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
- a. The claims-only measure uses administrative claims data only for risk adjustment

b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

For the hospital-wide readmission (HWR) measure that was previously endorsed and is used in the Hospital Inpatient Quality Reporting Program (IQR), the measure estimates a hospital-level risk-standardized readmission rate (RSRR) of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge. The measure reports a single summary RSRR, derived from the volume-weighted results of five different models, one for each of the following specialty cohorts based on groups of discharge condition categories or procedure categories: surgery/gynecology; general medicine; cardiorespiratory; cardiovascular; and neurology, each of which will be described in greater detail below. The measure also indicates the hospital-level standardized risk ratios (SRR) for each of these five specialty cohorts. The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission (the admission included in the measure cohort). A specified set of planned readmissions do not count in the readmission outcome. CMS annually reports the measure for patients who are 65 years or older, are enrolled in fee-for-service (FFS) Medicare, and hospitalized in non-federal hospitals.

For the All-Cause Readmission (ACR) measure version used in the Shared Savings Program (SSP), the measure estimates an Accountable Care Organization (ACO) facility-level RSRR of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge. The ACR measure is calculated using the same five specialty cohorts and estimates an ACO-level standardized risk ratio for each. CMS annually reports the measure for patients who are 65 years or older, are enrolled in FFS Medicare and are ACO assigned beneficiaries.

### 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The measure estimates a hospital-level risk-standardized complication rate (RSCR) associated with elective primary THA and TKA in Medicare Fee-For-Service beneficiaries who are 65 years and older. The outcome (complication) is defined as any one of the specified complications occurring from the date of index admission to 90 days post date of the index admission (the admission included in the measure cohort). The target population is patients 18 and over. CMS annually reports the measure for patients who are 65 years or older, are enrolled in fee-for-service (FFS) Medicare, and hospitalized in non-federal acute-care hospitals.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA). Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid

Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for-service (FFS) beneficiaries and hospitalized in non-federal acute care hospitals.

# 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD. Mortality is defined as death from any cause within 30 days of the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are Medicare fee-forservice (FFS) beneficiaries hospitalized in non-federal acute care hospitals

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 30 days of the procedure date of an index CABG admission. An index CABG admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older and was tested in all-payer patients 18 years and older.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI). Mortality is defined as death from any cause within 30 days after the index admission date. The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years and older and are Medicare fee-forservice (FFS) beneficiaries hospitalized in non-federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.

### Туре

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Outcome

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Outcome

### 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) Outcome

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Outcome

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Outcome

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Outcome

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Outcome

### Data Source

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:

1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

No data collection instrument provided Attachment Del18b1HOP5HWMClaimsDataDictionary01072019.xlsx

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Claims Data sources for the Medicare FFS measure:

HWR

1. Medicare Part A claims data for calendar years 2007 and 2008 were combined and then randomly split into two equal subsets (development sample and validation sample). Risk variable selection was done using the development sample, the risk models for each of the five specialty cohorts in the measure were applied to the validation sample and the models' performance was compared. In addition we re-tested the models in Medicare Part A claims data from calendar year 2009 to look for temporal stability in the models' performance. The number of measured entities and index admissions are listed below by specialty cohort.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission and following discharge from index admission

ACR

1. Medicare Part A claims data for calendar years 2013, 2014, and 2015.

2. Medicare Enrollment Database (EDB).

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

Available in attached appendix at A.1 Attachment NQF\_1789\_NQF\_Data\_Dictionary\_05-26-17\_v1.0.xlsx

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Claims, Other, Paper Medical Records Data sources:

The currently publically reported measure is specified and has been tested using:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status at discharge. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

During original measure development we validated the administrative claims-based definition of THA/TKA complication (original model specification) against a medical record data.

3. Data abstracted from medical records from eight participating hospitals (approximately 96 records per hospital; 644 total records) for Medicare beneficiaries over the age of 65 years who had a qualifying THA/TKA procedure between January 1 2007 and December 31, 2008.

The measure was also specified and testing using an all-payer claims dataset although it is only publically reported using the data sources listed above

4. California Patient Discharge Data is a large, linked database of patient hospital admissions in the state of California. Using all-payer data from California, we performed analyses to determine whether the THA/TKA complication measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 years or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Additional Data source used for analysis of the impact of SES variables on the measure's risk model. Note, the variables derived from these data are not included in the measure as specified

5. The American Community Survey (2009-2013): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score.

#### Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

Suter LG, Parzynski CS, Grady JN, et al. 2014 Procedure Specific Complication Measure Updates and Specifications Report: Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) Risk-Standardized Complication Measure (Version 3.0). 2014

No data collection instrument provided Attachment

NQF\_1550\_HipKnee\_Complication\_Data\_Dictionary\_v1.0.xlsx

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES composite index score.

4. Data sources for the all-payer update:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS patients aged 65 years or over (65+) in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2009, there were 3,193,904 adult discharges from 446 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the pneumonia mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission. Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0468\_Pneumonia\_Mortality\_Data\_Dictionary\_09-26-17\_v1.0.xls

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ SES composite index score.

4. Data sources for the all-payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California, we performed analyses to determine whether the COPD mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 or over, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_1893\_COPD\_Mortality\_NQF\_Data\_Dictionary\_v1.0\_091818\_kl.xlsx

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Claims Data sources for the Medicare FFS measure:

Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

The American Community Survey (2008-2012): The American Community Survey data is collected annually and an aggregated 5-years data was used to calculate the AHRQ socioeconomic status (SES) composite index score.

Data sources for the all-payer testing: For our analyses to examine use in all-payer data, we used all-payer data from California. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California, we performed analyses to determine whether the HF readmission measure can be applied to all adult patients, including not only FFS Medicare patients aged 65 years or older, but also non-FFS Medicare patients aged 18-64 years at the time of admission.

Reference:

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_2558\_CABG\_Mortality\_Data\_Dictionary\_12-30-16\_v1.0.xlsx

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. Veterans Health Administration Data: This data source contains claims data for VA inpatient and outpatient services including: inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission.

All-payer data sources:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous

hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the AMI mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission.

References:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0230\_AMI\_Mortality\_Data\_Dictionary\_Final-636973300643762106.xlsx

#### Level

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Facility

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Facility, Integrated Delivery System

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Facility

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Facility

- 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization Facility
- 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery Facility

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Facility

### Setting

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Inpatient/Hospital

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Inpatient/Hospital, Outpatient Services

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Inpatient/Hospital

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Inpatient/Hospital

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Inpatient/Hospital

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Inpatient/Hospital

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Inpatient/Hospital

#### Numerator Statement

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The outcome for the HWR measure is 30-day readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions, within 30 days from the date of discharge from an eligible index admission. If a patient has more than one unplanned admission (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. The measure looks for a dichotomous yes or no outcome of whether each admitted patient has an unplanned readmission within 30 days. However, if the first readmission after discharge is considered planned, any subsequent unplanned readmission is not counted as an outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission.

The outcome for the ACR measure is also 30-day readmission. The outcome is defined identically to what is described above for the HWR measure.

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The outcome for this measure is any complication occurring during the index admission (not coded present on arrival) to 90 days post-date of the index admission. Complications are counted in the measure only if they occur during the index hospital admission or during a readmission. The complication outcome is a dichotomous (yes/no) outcome. If a patient experiences one or more of these complications in the applicable time period, the complication outcome for that patient is counted in the measure as a "yes".

# 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia, or a principal discharge diagnosis of sepsis (not including severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary discharge diagnosis of severe sepsis.

Additional details are provided in S.5 Numerator Details.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with either a principal discharge diagnosis of COPD or a principal discharge diagnosis of respiratory failure with a secondary discharge diagnosis of acute exacerbation of COPD.

Additional details are provided in S.5 Numerator Details.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The outcome for this measure is 30-day all-cause mortality. Mortality is defined as death for any reason within 30 days of the procedure date from the index admission for patients 18 and older discharged from the hospital after undergoing isolated CABG surgery.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days from the date of admission for patients discharged from the hospital with a principal diagnosis of AMI.

Additional details are provided in S.5 Numerator Details.

#### Numerator Details

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of discharge of the index admission, excluding planned readmissions as defined below.

Planned Readmission Algorithm (Version 4.0)

The Planned Readmission Algorithm is a set of criteria for classifying readmissions as planned among the general Medicare population using Medicare administrative claims

data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The Planned Readmission Algorithm has three fundamental principles:

1. A few specific, limited types of care are always considered planned (obstetric delivery, transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);

2. Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and

3. Admissions for acute illness or for complications of care are never planned.

The algorithm was developed in 2011 as part of the Hospital-Wide Readmission measure. In 2013, CMS applied the algorithm to its other readmission measures.

The Planned Readmission Algorithm and associated code tables are attached in data field S.2b (Data Dictionary or Code Table).

## 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The composite complication is a dichotomous outcome (yes for any complication(s); no for no complications). Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes". Complications are counted in the measure only if they occur during the index hospital admission (and are not present on admission) or during a readmission.

The complications captured in the numerator are identified during the index admission OR associated with a readmission up to 90 days post-date of index admission, depending on the complication. The follow-up period for complications from date of index admission is as follows:

The follow-up period for AMI, pneumonia, and sepsis/septicemia/shock is seven days from the date of index admission because these conditions are more likely to be attributable to the procedure if they occur within the first week after the procedure. Additionally, analyses indicated a sharp decrease in the rate of these complications after seven days.

Death, surgical site bleeding, and pulmonary embolism are followed for 30 days following admission because clinical experts agree these complications are still likely attributable to the hospital performing the procedure during this period and rates for these complications remained elevated until roughly 30 days post admission.

The measure follow-up period is 90 days after admission for mechanical complications and periprosthetic joint infection/wound infection. Experts agree that mechanical complications and periprosthetic joint infection/wound infections due to the index THA/TKA occur up to 90 days following THA/TKA.

The measure counts all complications occurring during the index admission regardless of when they occur. For example, if a patient experiences an AMI on day 10 of the index admission, the measure will count the AMI as a complication, although the specified follow-up period for AMI is seven days. Clinical experts agree with this approach, as such complications likely represent the quality of care provided during the index admission.

As of 2014 reporting, the measure does not count complications in the complications outcome that are coded as POA during the index admission; this prevents identifying a condition as a complication of care if it was present on admission for the THA/TKA procedure.

For full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheet "Complication Codes ICD9-ICD10".

# 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

### Outcome definition

This measure counts death from any cause within 30 days of the index admission date.

Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2017; Dharmarajan et al., 2015).

Identifying deaths in the Medicare FFS population

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer population

For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI).

### References:

1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet Tier3&cid=1163010421830. Accessed June 7, 2017.

2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical research ed);350:h411

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

### Outcome definition

This measure counts death from any cause within 30 days of the index admission date.

Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and appropriate transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2018; Dharmarajan et al., 2015).

Identifying deaths in the Medicare FFS population

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

#### Reference:

1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures.

http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet Tier3&cid=1163010421830. Accessed June 6, 2018.

2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

In the current publicly reported measure, we identify deaths for Medicare FFS patients 65 years or older in the Medicare Enrollment Database (EDB).

Outcome Attribution:

Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves a qualifying isolated CABG procedure is as follows:

1) If a patient undergoes a CABG procedure in the first hospital and is then transferred to a second hospital where there is no CABG procedure, the mortality outcome is attributed to the first hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: A transfer following CABG is most likely due to a complication of the index procedure and that care provided by the hospital performing the CABG procedure likely dominates mortality risk even among transferred patients.

2) If a patient is admitted to a first hospital but does not receive a CABG procedure there and is then transferred to a second hospital where a CABG is performed, the mortality outcome is attributed to the second hospital performing the index CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: Care provided by the hospital performing the CABG procedure likely dominates mortality risk.

3) If a patient undergoes a CABG procedure in the first hospital and is transferred to a second hospital where another CABG procedure is performed, the mortality outcome is attributed to the first hospital performing the index (first) CABG procedure and the 30-day window starts with the date of index CABG procedure.

Rationale: A transfer following CABG is most likely due to a complication of the index procedure, and care provided by the hospital performing the index CABG procedure likely dominates mortality risk even among transferred patients.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

#### Outcome definition

This measure counts death from any cause within 30 days after the index admission date.

Rationale: From a patient perspective, death is the most critical outcome regardless of cause. Outcomes occurring within 30 days of admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality. (Simoes et al., 2018; Dharmarajan et al., 2015).

Identifying deaths in the Medicare FFS population

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer population

For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI). Reference:

1. Simoes J, Grady J, Purvis D, et al. 2018 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. <u>http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet</u> <u>Tier3&cid=1163010421830</u>. Accessed May 4, 2018.

#### **Denominator Statement**

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure at the hospital level includes admissions for Medicare beneficiaries who are 65 years and older and are discharged from all non-federal, acute care inpatient US hospitals (including territories) with a complete claims history for the 12 months prior to admission.

The measure at the ACO level includes all relevant admissions for ACO assigned beneficiaries who are 65 and older and are discharged from all non-Federal short-stay acute care hospitals, including critical access hospitals.

Additional details are provided in S.9 Denominator Details.

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The target population for the publically reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing elective primary THA and/or TKA procedures.

Additional details are provided in S.9 Denominator Details.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients aged 18 years and older discharged from the hospital with a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or a principal discharge diagnosis of sepsis (not including severe sepsis) with a

secondary diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA, and with a complete claims history for the 12 months prior to admission.

The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non-federal acute care hospitals.

Additional details are provided in S.7 Denominator Details.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients discharged from the hospital with either a principal discharge diagnosis of COPD, or a principal discharge diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD; and with a complete claims history for the 12 months prior to admission.

The measure is currently publicly reported by CMS for those patients 65 years and older who are Medicare FFS beneficiaries admitted to non-federal hospitals

Additional details are provided in S.7 Denominator Details.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients who receive a qualifying isolated CABG procedure (see the attached Data Dictionary) and with a complete claims history for the 12 months prior to admission. CMS publicly reports this measure for those patients 65 years or older who are Medicare FFS beneficiaries admitted to non-federal hospitals.

If a patient has more than one qualifying isolated CABG admission in a year, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

# 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have tested the measure in both age groups.

The cohort includes admissions for patients discharged from the hospital with a principal discharge diagnosis of AMI and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.

Additional details are provided in S.7 Denominator Details.

### **Denominator Details**

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission

Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.

2. Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

3. Aged between 65 and 94 years

Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.

Note that the hybrid measure (submitted for NQF endorsement in parallel with the claimsonly measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

4. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.

7. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue.

However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

9. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical

procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

To be included in the hospital level measure, cohort patients must be:

1. Enrolled in Medicare fee-for-service (FFS) Part A for the 12 months prior to the date of admission and during the index admission;

- 2. Aged 65 or over;
- 3. Discharged alive from a non-federal short-term acute care hospital; and
- 4. Not transferred to another acute care facility.

The ACO version of this measure has the additional criterion that only hospitalizations for ACO-assigned beneficiaries that meet all of the other criteria listed above are included. The cohort definition is otherwise identical to that of the HWR described below.

The measure aggregates the ICD-9 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the AHRQ CCS. There are a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections." There are a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of five mutually exclusive specialty cohorts: surgery/gynecology, cardiorespiratory, cardiovascular, neurology, and medicine. The rationale behind this organization is that conditions typically cared for by the same team of clinicians are expected to experience similar added (or reduced) levels of readmission risk.

The measure first assigns admissions with qualifying AHRQ procedure categories to the Surgery/Gynecology Cohort. This cohort includes admissions likely cared for by surgical or gynecological teams.

The measure then sorts admissions into one of the four remaining specialty cohorts based on the AHRQ diagnosis category of the principal discharge diagnosis:

The Cardiorespiratory Cohort includes several condition categories with very high readmission rates such as pneumonia, chronic obstructive pulmonary disease, and heart failure. These admissions are combined into a single cohort because they are often clinically indistinguishable and patients are often simultaneously treated for several of these diagnoses.

The Cardiovascular Cohort includes condition categories such as acute myocardial infarction that in large hospitals might be cared for by a separate cardiac or cardiovascular team.

The Neurology Cohort includes neurologic condition categories such as stroke that in large hospitals might be cared for by a separate neurology team.

The Medicine Cohort includes all non-surgical patients who were not assigned to any of the other cohorts.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the specialty cohorts are attached in data field S.2b (Data Dictionary or Code Table).

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission;

2. Aged 65 or older

3. Having a qualifying elective primary THA/TKA procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following:

• Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission

• Partial hip arthroplasty (PHA) procedures (with a concurrent THA/TKA); partial knee arthroplasty procedures are not distinguished by ICD9 codes and are currently captured by the THA/TKA measure

- Revision procedures with a concurrent THA/TKA
- Resurfacing procedures with a concurrent THA/TKA
- Mechanical complication coded in the principal discharge
- Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field
- Removal of implanted devises/prostheses
- Transfer status from another acute care facility for the THA/TKA

Patients are eligible for inclusion in the denominator if they had an elective primary THA and/or a TKA AND had continuous enrollment in Part A and Part B Medicare fee-for-service (FFS) 12 months prior to the date of index admission.

This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years (see Section 2b4.11 of the Testing Attachment for details, 2b4.11).

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each measure are:

ICD-9-CM codes used to define a THA or TKA:

81.51 Total Hip Replacement

81.54 Total Knee Replacement

ICD-10 Codes that define a THA or TKA:

OSR90J9 Replacement of Right Hip Joint with Synthetic Substitute, Cemented, Open Approach

OSR90JA Replacement of Right Hip Joint with Synthetic Substitute, Uncemented, Open Approach

OSR90JZ Replacement of Right Hip Joint with Synthetic Substitute, Open Approach OSRB0J9 Replacement of Left Hip Joint with Synthetic Substitute, Cemented, Open Approach

OSRBOJA Replacement of Left Hip Joint with Synthetic Substitute, Uncemented, Open Approach

OSRBOJZReplacement of Left Hip Joint with Synthetic Substitute, Open Approach OSRC07Z Replacement of Right Knee Joint with Autologous Tissue Substitute, Open Approach

OSRCOJZReplacement of Right Knee Joint with Synthetic Substitute, Open Approach OSRCOKZ Replacement of Right Knee Joint with Nonautologous Tissue Substitute, Open Approach

OSRD07Z Replacement of Left Knee Joint with Autologous Tissue Substitute, Open Approach

OSRDOJZ Replacement of Left Knee Joint with Synthetic Substitute, Open Approach

OSRDOKZReplacement of Left Knee Joint with Nonautologous Tissue Substitute, Open Approach

OSRT07Z Replacement of Right Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

OSRTOJZ Replacement of Right Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

OSRTOKZ Replacement of Right Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

OSRU07Z Replacement of Left Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

OSRU0JZ Replacement of Left Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

OSRUOKZ Replacement of Left Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

OSRV07Z Replacement of Right Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

OSRVOJZ Replacement of Right Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

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OSRVOKZ Replacement of Right Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach

OSRW07Z Replacement of Left Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

OSRWOJZ Replacement of Left Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

OSRWOKZ Replacement of Left Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach

An ICD-9 to ICD-10 crosswalk is attached in field S.2b. (Data Dictionary or Code Table).

Elective primary THA/TKA procedures are defined as those procedures without any of the following:

1) Femur, hip, or pelvic fractures coded in principal or secondary discharge diagnosis fields of the index admission

2) Partial hip arthroplasty (PHA) procedures with a concurrent THA/TKA

3) Revision procedures with a concurrent THA/TKA

4) Resurfacing procedures with a concurrent THA/TKA

5) Mechanical complication coded in the principal discharge

6) Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field

7) Removal of implanted devises/prostheses

8) Transfer status from another acute care facility for the THA/TKA

For a full list of ICD-9 and ICD-10 codes defining the following see attached Data Dictionary, sheet "THA TKA Cohort Codes Part 2."

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria:

1. Have a principal discharge diagnosis of pneumonia (including aspiration pneumonia) or

sepsis (not including severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia) coded as POA and no secondary diagnosis of severe sepsis coded as POA;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission;

3. Aged 65 or over; and

4. Not transferred from another acute care facility

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

# 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria:

1. Have principal discharge diagnosis of COPD or principal discharge diagnosis of respiratory failure with a secondary diagnosis of COPD with exacerbation;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of index admission, and enrolled in Part A during the index admission, beneficiaries;

3. Aged 65 or over; and

4. Not transferred from another acute care facility.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure included index admissions for patients:

1. Having a qualifying isolated CABG surgery during the index admission;

2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of the index admission, and enrolled in Part A during the index admission; and,

3. Aged 65 or over.

Isolated CABG surgeries are defined as those CABG procedures performed without the following concomitant valve or other major cardiac, vascular, or thoracic procedures:

- o Valve procedures;
- o Atrial and/or ventricular septal defects;
- o Congenital anomalies;
- o Other open cardiac procedures;
- o Heart transplants;
- o Aorta or other non-cardiac arterial bypass procedures;
- o Head, neck, intracranial vascular procedures; or,
- o Other chest and thoracic procedures

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9) codes as well as International Classification of Disease, 10th Revision (ICD-10) codes used to define the cohort are listed in the attached Data Dictionary.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Having a principal discharge diagnosis of AMI;

2. Enrolled in Medicare FFS Part A and Part B for the first 12 months prior to the date of admission, enrolled in Part A during the index admission, or those who are VA beneficiaries;

3. Aged 65 or over; and

4. Not transferred from another acute care facility.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

### Exclusions

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;

2. Discharged against medical advice (AMA);

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

The measure excludes index admissions for patients:

- 1. Admitted to Prospective Payment System (PPS)-exempt cancer hospitals;
- 2. Without at least 30 days post-discharge enrollment in FFS Medicare;
- 3. Discharged against medical advice (AMA);
- 4. Admitted for primary psychiatric diagnoses;
- 5. Admitted for rehabilitation; or
- 6. Admitted for medical treatment of cancer.

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure excludes index admissions for patients:

- 1. Without at least 90 days post-discharge enrollment in FFS Medicare;
- 2. Who were discharged against medical advice (AMA); or,
- 3. Who had more than two THA/TKA procedure codes during the index hospitalization.

After applying these exclusion criteria, we randomly select one index admission for patients with multiple index admissions in a calendar year. We therefore exclude the other eligible index admissions in that year.

# 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

This mortality measure excludes index admissions for patients:

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;

2. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

3. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or,

4. Discharged against medical advice.

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

2. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission; or

3. Discharged against medical advice

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.

Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The CABG surgery mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; or,

2. Discharged against medical advice (AMA).

For patients with more than one qualifying CABG surgery admission in the measurement period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

## 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The mortality measure excludes index hospitalizations that meet any of the following exclusion criteria:

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility;

2. Inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission, or

4. Discharged against medical advice (AMA).

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

Similarly, for the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

### **Exclusion Details**

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data

Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240)

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1. Admitted to a PPS-exempt cancer hospital, identified by the Medicare provider ID.

2. Admissions without at least 30 days post-discharge enrollment in FFS Medicare are determined using data captured in the Medicare Enrollment Database (EDB).

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in claims data.

4. Admitted for primary psychiatric disease, identified by a principal diagnosis in one of the specific AHRQ CCS categories listed in the attached data dictionary.

5. Admitted for rehabilitation care, identified by the specific ICD-9 diagnosis codes included in CCS 254 (Rehabilitation care; fitting of prostheses; and adjustment of devices).

Admitted for medical treatment of cancer, identified by the specific AHRQ CCS categories listed in the attached data dictionary.

### 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure excludes index admissions for patients:

1. Without at least 90 days post-discharge enrollment in FFS Medicare

Rationale: The 90-day complication outcome cannot be assessed in this group since claims data are used to determine whether a complication of care occurred.

2. Who were discharged against medical advice (AMA); or,

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. Who had more than two THA/TKA procedure codes during the index hospitalization

Rationale: Although clinically possible, it is highly unlikely that patients would receive more than two elective THA/TKA procedures in one hospitalization, which may reflect a coding error.

### 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

1. Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years; 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male' or 'female'.

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice enrollment data.

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator.

After exclusions #1-3 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

## 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

1. Inconsistent vital status or unreliable demographic data in the claims

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database. Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse outcome or signal of poor quality care.

2. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in the claim.

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

Individual codes with descriptors can be found in the attached Data Dictionary.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The CABG surgery mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data.

Rationale: We do not include stays for patients where the age (indicated in the claim) is greater than 115, where the gender (indicated in the claim) is neither male nor female, where the admission date (indicated in the claim) is after the date of death in the Medicare Enrollment Database, or where the date of death (in the Medicare Enrollment Database) occurs before the date of discharge but the patient was discharged alive (indicated in the claim).

2. Discharged against medical advice (AMA).

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. This information is taken from the discharge disposition in the claim.

3. With more than one qualifying CABG surgery admission in the measurement period.

Rationale: CABG procedures are expected to last for several years without the need for revision or repeat revascularization. A repeat CABG procedure during the measurement period likely represents a complication of the original CABG procedure and is a clinically more complex and higher risk surgery. Therefore, we select the first CABG surgery admission for inclusion in the measure and exclude subsequent CABG surgery admissions (additional claims indicating a CABG procedure was performed within 30-days of the index CABG procedure) from the cohort.

# 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

1. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility. Discharges are identified using data from the claims.

Rationale: It is unlikely that these patients had clinically significant AMI.

2. Inconsistent or unknown vital status or other unreliable demographic data

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

3. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission. Enrollment to Medicare beneficiaries is determined using the Medicare Enrollment Database.

Rationale: These patients are likely continuing to seek comfort measures only, so mortality is not necessarily an adverse outcome or signal of poor quality care.

4. Discharged against medical advice. Discharge status is identified using the claims

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

After exclusions #1-4 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent.

For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. July admissions are excluded to avoid assigning a single death to two admissions.

#### Risk Adjustment

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Statistical risk model

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

#### Statistical risk model

Our approach to risk adjustment is tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes" (Krumholz et al., 2006).

The HWR measure employs a hierarchical logistic regression model to create a hospitallevel 30-day RSRR. In brief, the approach simultaneously models data at the patient and hospital levels to account for the variance in patient outcomes within and between hospitals (Normand & Shahian, 2007). At the patient level, the model adjusts the log-odds of readmission within 30 days of discharge for age and selected clinical covariates. At the hospital level, the approach models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of readmission at the hospital, after accounting for patient risk. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals. We use a fixed, common set of variables in all our models for simplicity and ease of data collection and analysis. However, we estimate a hierarchical logistic regression model for each specialty cohort separately, and the coefficients associated with each variable may vary across specialty cohorts.

Candidate and Final Risk-adjustment Variables: Candidate variables were patient-level riskadjustors that were expected to be predictive of readmission, based on empirical analysis, prior literature, and clinical judgment, including age and indicators of comorbidity and disease severity. For each patient, covariates are obtained from claims records extending 12 months prior to and including the index admission. For the measure currently implemented by CMS, these risk-adjusters are identified using inpatient Medicare FFS claims data.

The model adjusts for case-mix differences based on the clinical status of patients at the time of admission. We use condition categories (CCs), which are clinically meaningful groupings of more than 15,000 ICD-9-CM diagnosis codes (Pope et al., 2000). A file that contains a list of the ICD-9-CM codes and their groupings into CCs is attached in data field S.2b (Data Dictionary or Code Table). In addition, only comorbidities that convey information about the patient at admission or in the 12 months prior, and not complications that arise during the course of the index hospitalization, are included in the risk adjustment. Hence, we do not risk adjust for CCs that may represent adverse events of care when they are only recorded in the index admission. The models also include a condition-specific indicator for all AHRQ CCS categories with sufficient volume (defined as those with more than 1,000 admissions nationally each year for Medicare FFS data) as well as a single indicator for conditions with insufficient volume in each model.

The final set of risk adjustment variables are listed in the attached Data Dictionary.

**Demographics** 

Age-65 (years, continuous) for patients aged 65 or over cohorts; or Age (years, continuous) for patients aged 18 and over cohorts

Comorbidities

Metastatic cancer or acute leukemia (CC 7)

Severe cancer (CC 8-9)

Other cancers (CC 10-12)

Severe hematological disorders (CC 44)

Coagulation defects and other specified hematological disorders (CC 46)

Iron deficiency or other unspecified anemias and blood disease (CC 47)

End-stage liver disease (CC 25-26)

Pancreatic disease (CC 32)

Dialysis status (CC 130)

Renal failure (CC 131)

Transplants (CC 128, 174)

Severe infection (CC 1, 3-5)

Other infectious diseases and pneumonias (CC 6, 111-113)

Septicemia/shock (CC 2)

Congestive heart failure (CC 80)

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Coronary atherosclerosis or angina, cerebrovascular disease (CC 81-84, 89, 98-99, 103-106)

Specified arrhythmias and other heart rhythm disorders (CC 92-93)

Cardio-respiratory failure or shock (CC 79)

Chronic obstructive pulmonary disease (COPD) (CC 108)

Fibrosis of lung or other chronic lung disorders (CC 109)

Protein-calorie malnutrition (CC 21)

Disorders of fluid/electrolyte/acid-base (CC 22-23)

Rheumatoid arthritis and inflammatory connective tissue disease (CC 38)

Diabetes mellitus (DM) or DM complications (CC 15-20, 119-120)

Decubitus ulcer or chronic skin ulcer (CC 148-149)

Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177-178)

Seizure disorders and convulsions (CC 74)

Respirator dependence/tracheostomy status (CC 77)

Drug/alcohol psychosis or dependence (CC 51-52)

Psychiatric comorbidity (CC 54-56, 58, 60)

Hip fracture/dislocation (CC 158)

**Principal Diagnoses** 

Refer to the 2015 Measure Updates and Specifications: Hospital-Wide All-Cause Unplanned Readmission - Version 4.0 referenced here for the full lists of principal diagnosis AHRQ CCS categories included in each specialty cohort risk adjustment model.

The ACR measure employs the same risk adjustment methodology and uses the same risk variables.

References:

Krumholz HM, Brindis RG, Brush JE, et al. 2006. Standards for Statistical Models Used for Public Reporting of Health Outcomes: An American Heart Association Scientific Statement From the Quality of Care and Outcomes Research Interdisciplinary Writing Group: Cosponsored by the Council on Epidemiology and Prevention and the Stroke Council Endorsed by the American College of Cardiology Foundation. Circulation 113: 456-462.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22 (2): 206-226.

Pope GC, et al. 2000. Principal Inpatient Diagnostic Cost Group Models for Medicare Risk Adjustment. Health Care Financing Review 21(3): 93-118.

Available in attached Excel or csv file at S.2b

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Statistical risk model

# 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Statistical risk model

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Statistical risk model

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Statistical risk model

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Statistical risk model

Stratification

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

N/A

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

N/A

- 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) N/A
- 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

N/A

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

N/A

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

N/A

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

N/A

#### Type Score

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Rate/proportion better quality = lower score

1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

Rate/proportion better quality = lower score

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Rate/proportion better quality = lower score

0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Rate/proportion better quality = lower score

1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

Rate/proportion better quality = lower score

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Rate/proportion better quality = lower score

0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

Rate/proportion better quality = lower score

#### Algorithm

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific

effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse varianceweighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

#### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

This measure estimates a hospital-level 30-day all-cause RSRR using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient, and hospital levels to account for variance in patient outcomes within and between hospitals (Normand et al., 2007). At the patient level, it models the log-odds of readmission within 30 days of discharge using age, selected clinical covariates, and a hospital -specific effect. At the hospital level, the approach models the hospital- specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of a readmission, after accounting for patient risk. The hospital-specific effects are given a distribution to account for the clustering (non-independence) of patients within the same hospital (Normand et al., 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals.

Admissions are assigned to one of five mutually exclusive specialty cohort groups consisting of related conditions or procedures. For each specialty cohort group, the standardized readmission ratio (SRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case mix and service mix, and the denominator is the number of readmissions expected based on the nation's performance with that hospital's case mix and service mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected readmission rates or better quality, while a higher ratio indicates higher-than-expected readmission rates or worse quality.

For each specialty cohort, the "predicted" number of readmissions (the numerator) is calculated by using the coefficients estimated by regressing the risk factors (found in Table D.9) and the hospital-specific effect on the risk of readmission. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of readmissions (the denominator) is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are log transformed and summed over all patients in the hospital to get an expected value.

To assess hospital performance for each reporting period, we re-estimate the model coefficients using the data in that period.

The specialty cohort SRRs are then pooled for each hospital using a volume-weighted geometric mean to create a hospital-wide composite SRR. The composite SRR is multiplied by the national observed readmission rate to produce the RSRR. The statistical modeling approach is described fully in Appendix A and in the original methodology report (Horwitz et al., 2012).

The ACR quality measure was adapted from the HWR quality measure. The unit of analysis was changed from the hospital to the ACO. This was possible because both the HWR and ACR measures assess readmission performance for a population that clusters patients together (either in hospitals or in ACOs). The goal is to isolate the effects of beneficiary characteristics on the probability that a patient will be readmitted from the effects of being in a specific hospital or ACO. In addition, planned readmissions are excluded for the ACR quality measure in the same way that they are excluded for the HWR measure. The ACR measure is calculated identically to what is described above for the HWR measure. References:

Horwitz L, Partovian C, Lin Z, et al. Hospital-Wide All-Cause Unplanned Readmission Measure: Final Technical Report. 2012;

http://www.qualitynet.org/dcs/BlobServer?blobkey=id&blobnocache=true&blobwhere=12 28889825199&blobheader=multipart%2Foctet-stream&blobheadername1=Content-Disposition&blobheadervalue1=attachment%3Bfilename%3DDryRun\_HWR\_TechReport\_0 81012.pdf&blobcol=urldata&blobtable=MungoBlobs. Accessed 30 April, 2014.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226. Available in attached appendix at A.1

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The measure estimates hospital-level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of a complication occurring within 90 days of the index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a complication at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given hospital, multiplied by the national observed complication rate. For each hospital, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of complications expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an

average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected complication rates or better quality, and a higher ratio indicates higher-than-expected complication rates or worse quality.

The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of having an admission with a complication. The estimated hospitalspecific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of admissions with a complication (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific effect. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed complication rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2012). References:

Grosso L, Curtis J, Geary L, et al. Hospital-level Risk-Standardized Complication Rate Following Elective Primary Total Hip Arthroplasty (THA) And/Or Total Knee Arthroplasty (TKA) Measure Methodology Report. 2012.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

## 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for pneumonia using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates

or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are log transformed and summed over all patients are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

# 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for COPD using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are log transformed and summed over all patients are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure estimates hospital-level 30-day all-cause RSMRs for CABG surgery using a hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of the procedure date using age, sex, selected clinical covariates, and a hospital-specific effect. At the hospital level, the approach models the hospital-specific effects as arising from a normal distribution. The hospital effect represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific effects are given a distribution to account for the clustering (non-independence) of patients within the same hospital (Normand and Shahian, 2007). If there were no differences among hospitals, then after adjusting for patient risk, the hospital effects should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated

regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Suter et al. 2012).

Reference:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Suter L, Wang C, Araas M, et al. Hospital-Level 30-day All-Cause Mortality Following Coronary

Artery Bypass Graft Surgery; Updated Measure Methodology Report. 2012

# 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for AMI using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of discharge using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths, multiplied by the national unadjusted mortality rate. For each hospital, the numerator of the ratio ("predicted") is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator ("expected") is the number of deaths expected on the basis of the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower- than-expected mortality or better quality and a higher ratio indicates higher-than-expected mortality or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted

value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital specific intercept. The results are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed readmission rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology. 2005.

#### Submission items

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore, are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into, to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into five categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric

patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. Hospital-wide mortality captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures inhospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value: There are no competing NQF-endorsed measures.

### 1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

5.1 Identified measures: 1768 : Plan All-Cause Readmissions (PCR)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0695 : Hospital 30-Day Risk-Standardized Readmission Rates following Percutaneous Coronary Intervention (PCI)

0329 : Risk-Adjusted 30-Day All-Cause Readmission Rate

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: This measure and the National Committee for Quality Assurance (NCQA) Plan All-Cause Readmissions (PCR) Measure #1768 are related measures, but are not competing because they don't have the same measure focus and same target population. In addition, both have been previously harmonized to the extent possible under the guidance of the National Quality Forum Steering Committee in 2011. Each of these measures has different specifications. NCQA's Measure #1768 counts the number of inpatient stays for patients aged 18 and older during a measurement year that were followed by an acute readmission for any diagnosis to any hospital within 30 days. It contrasts this count with a calculation of the predicted probability of an acute readmission. NCQA's measure is intended for quality monitoring and accountability at the health plan level. This measure estimates the risk-standardized rate of unplanned, all-cause readmissions to a hospital or ACO for any eligible condition within 30 days of hospital discharge for patients aged 18 and older. The measure will result in a single summary risk-adjusted readmission rate for conditions or procedures that fall under five specialties: surgery/gynecology, general medicine, cardiorespiratory, cardiovascular, and neurology. This measure is specified for evaluating hospital or ACO performance. However, despite these differences in cohort specifications, both measures under NQF guidance have been harmonized to the extent possible through modifications

such as exclusion of planned readmissions. We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

# 1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

5.1 Identified measures: 0534 : Hospital specific risk-adjusted measure of mortality or one or more major complications within 30 days of a lower extremity bypass (LEB).

0564 : Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

2052 : Reduction of Complications through the use of Cystoscopy during Surgery for Stress Urinary Incontinence

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome measures (for example, process measures) with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

# 0468 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

5.1 Identified measures: 0708 : Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window)

0231 : Pneumonia Mortality Rate (IQI #20)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0279 : Community Acquired Pneumonia Admission Rate (PQI 11)

2579 : Hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia (PN)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: The pneumonia mortality measure cohort, version 9.0, is harmonized with the hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia cohort. Version 9.2 of the pneumonia mortality measure cohort is, however, not harmonized with

the pneumonia payment measure cohort. There is intention to harmonize the pneumonia mortality and payment measure cohorts in the future. We did not include in our list of related measures any non-outcome (for example, process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Lastly, this measure and the NQF Inpatient Pneumonia Mortality (AHRQ) Measure #0231 are complementary rather than competing measures. Although they both assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of pneumonia, the specified outcomes are different. This measure assesses 30day mortality while #0231 assesses inpatient mortality. Assessment of 30-day and inpatient mortality outcomes have distinct advantages and uses which make them complementary as opposed to competing. For example the 30-day period provides a broader perspective on hospital care and utilizes standard time period to examine hospital performance to avoid bias by differences in length of stay among hospitals. However, in some settings it may not be feasible to capture post-discharge mortality making the inpatient measure more useable. We have previously consulted with AHRQ to examine harmonization of complementary measures of mortality for patients with AMI and stroke. We have found that the measures are harmonized to the extent possible given that small differences in cohort inclusion and exclusion criteria are warranted on the basis of the use of different outcomes. However, this current measure has been modified from the last endorsed version to include patients with a principal discharge diagnosis of sepsis and a secondary discharge diagnosis of pneumonia that is present on admission. The cohort was also expanded to include patients with a principal discharge diagnosis of aspiration pneumonia. Thus the current measure cohort is no longer harmonized with measure #0231.

5b.1 If competing, why superior or rationale for additive value: N/A

# 1893 Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

5.1 Identified measures: 0701 : Functional Capacity in COPD patients before and after Pulmonary Rehabilitation

0700 : Health-related Quality of Life in COPD patients before and after Pulmonary Rehabilitation

0275 : Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate (PQI 05)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (for example, process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. Additionally, the measure, with the specified cohort, has been publicly reported since December 2014. Because this is an outcome measure, clinical coherence of the cohort takes precedence

over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

### 2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

5.1 Identified measures: 0114 : Risk-Adjusted Postoperative Renal Failure

0115 : Risk-Adjusted Surgical Re-exploration

0119 : Risk-Adjusted Operative Mortality for CABG

0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery

0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery

0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)

0130 : Risk-Adjusted Deep Sternal Wound Infection

0131 : Risk-Adjusted Stroke/Cerebrovascular Accident

0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0535 : 30-day all-cause risk-standardized mortality rate following percutaneous coronary intervention (PCI) for patients without ST segment elevation myocardial infarction (STEMI) and without cardiogenic shock

0536 : 30-day all-cause risk-standardized mortality rate following Percutaneous Coronary Intervention (PCI) for patients with ST segment elevation myocardial infarction (STEMI) or cardiogenic shock

1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

2515 : Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. In addition, the related claims-based CABG readmission measure, which utilizes the same definition of isolated CABG as the mortality measure, was validated using STS clinical registry data. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due

to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: The NQF-endorsed STS measure that has the same target population and similar measure focus as the proposed CABG mortality measure is the Risk-adjusted operative mortality for CABG (NQF #0119). The measure steward for the registry-based mortality measure for CABG is STS. In developing the measure, we sought to harmonize with the STS measure to the greatest extent feasible given competing measure design objectives and differences in the data source. The potential sources of discrepancy are target patient population, age, isolated CABG, period of observation, and included hospitals. The STS measure also assesses both deaths occurring during CABG hospitalization (in-hospital death, even if after 30 days) and deaths occurring within 30 days of procedure date. As indicated above, the proposed measure uses a standard follow-up period of 30 days of procedure date in order to measure each patient consistently. The proposed claims-based measure has been tested and is appropriate for use in all-payer data for patients 18 years and over. Finally, the STS cardiac surgery registry currently enrolls most, but not all, patients receiving CABG surgeries in the U.S. The proposed CABG mortality measure will capture all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry.

# 0230 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

5.1 Identified measures: 2431 : Hospital-level, risk-standardized payment associated with a 30-day episode-of-care for Acute Myocardial Infarction (AMI)

1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the

same target population as our measure. Our measure cohort was heavily vetted by clinical experts. Additionally, the measure, with the specified cohort, has been publicly reported since 2008. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). 5b.1 If competing, why superior or rationale for additive value: N/A

# Comparison of NQF 3504, 1789, 1550, 0468, 1893, 2558, 0230, 0229, 2876, 0347 and 0530 continued...

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

0530 Mortality for Selected Conditions

#### Steward

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Centers for Medicare & Medicaid Services (CMS)

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Centers for Medicare & Medicaid Services

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Centers for Medicare & Medicaid Services (CMS)
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Agency for Healthcare Research and Quality

#### **0530 Mortality for Selected Conditions**

Agency for Healthcare Research and Quality

### Description

## 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.

b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

2. Age of patients in cohort:

- a. The claims-only measure includes Medicare FFS patients, age 65-94.
- b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
- 3. External empiric validity testing

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

4. Socioeconomic risk factor analyses

a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.

5. Exclusion analyses

a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.

6. Meaningful differences

a. To be representative of what we expect the range of performance would be in a nationwide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

- 1. Risk adjustment:
- a. The claims-only measure uses administrative claims data only for risk adjustment

b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR). Mortality is defined as death for any cause within 30 days after the admission date for the index admission, for patients 18 and older discharged from the hospital with a principal diagnosis of heart failure (HF). The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for patients who are 65 years or older and are either Medicare fee-for-service (FFS) beneficiaries and hospitalized in non-federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

This stroke mortality measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a newly developed measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

In-hospital deaths per 1,000 discharges for low mortality (< 0.5%) Diagnosis Related Groups (DRGs) among patients ages 18 years and older or obstetric patients. Excludes cases with trauma, cases with cancer, cases with an immunocompromised state, and transfers to an acute care facility.

[NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]

#### **0530 Mortality for Selected Conditions**

A composite measure of in-hospital mortality indicators for selected conditions.

#### Туре

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Outcome

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Outcome

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Outcome
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Outcome

**0530 Mortality for Selected Conditions** 

Composite

#### Data Source

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:

1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized

from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

No data collection instrument provided Attachment Del18b1HOP5HWMClaimsDataDictionary01072019.xlsx

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Claims, Other, Paper Medical Records Data sources for the Medicare FFS measure:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for FFS inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. Veterans Health Administration (VA) Data: This data source contains claims data for VA inpatient and outpatient services including: inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to and including each index admission. Unlike Medicare FFS patients, VA patients are not required to have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission.

All-payer data sources:

For our analyses to examine use in all-payer data, we used all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the HF mortality measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 18-64 years at the time of admission.

#### Reference:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91.

No data collection instrument provided Attachment NQF\_0229\_S2b\_HF\_Mortality\_Data\_Dictionary\_v1.0\_Final-636973301131111819.xlsx

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

Claims (Only), Other, Registry For measure implementation the data sources will be:

1. Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission, as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

3. For measure development purposes only, we linked the data sources above with data from the AHA/ASA GWTG-Stroke Registry. The registry data were used to obtain the National Institutes of Health (NIH) Stroke Scale scores and clinical risk variables. When this measure is implemented NIH Stroke Scale scores will be derived from ICD-10 codes in Medicare claims.

Reference:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. Medical Care. 1992; 30(5): 377-91. Data sources for the all-payer update

No data collection instrument provided Attachment NQF\_2876\_Claims-Only\_Stroke\_Mortality\_S2b\_Mortality\_Data\_Dictionary\_v1.0-635884757617681755.xlsx

## 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Claims While the measure is tested and specified using data from the Healthcare Cost and Utilization Project (HCUP) (see section 1.1 and 1.2 of the measure testing form), the measure specifications and software are specified to be used with any ICD-9-CM-coded administrative billing/claims/discharge dataset with Present on Admission (POA) information. Note that in Version 5.0 (April 2015), the AHRQ QI software will no longer support prediction of POA status using an embedded prediction module. Users are expected to provide POA data.

Available at measure-specific web page URL identified in S.1 Attachment PSI\_02\_Death\_Rate\_in\_Low-Mortality\_Diagnosis\_Related\_Groups\_-DRGs-\_-\_Editable.xlsx

### **0530 Mortality for Selected Conditions**

Electronic administrative data/claims

Level

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Facility

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Facility

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Facility
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Facility

**0530 Mortality for Selected Conditions** 

Facility/Agency

#### Setting

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Inpatient/Hospital

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Inpatient/Hospital, Other Hospital & amp; Hospital: Acute Care Facility

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Hospital
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Inpatient/Hospital

#### **0530 Mortality for Selected Conditions**

Hospital

### Numerator Statement

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days of the index admission date for patients 65 and older discharged from the hospital with a principal diagnosis of HF.

Additional details are provided in S.5 Numerator Details.

## 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for patients with a principal discharge diagnosis of acute ischemic stroke.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

#### **0530 Mortality for Selected Conditions**

Number of in-hospital deaths

#### Numerator Details

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

#### **Outcome Definition**

The measure counts deaths for any cause within 30 days of the date of admission of the index HF hospitalization.

Rationale: From a patient perspective, death is a critical outcome regardless of cause. Outcomes occurring within 30 days of the start of the admission can be influenced by hospital care and early transition to the non-acute care setting. The 30-day time frame is a clinically meaningful period for hospitals to collaborate with their communities to reduce mortality (Simoes et al., 2017; Dharmarajan et al., 2015).

Identifying deaths in the FFS measure

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer measure

For the purposes of development of an all-payer measure, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI). Reference:

1. Simoes J, Grady J, DeBuhr J, et al. 2017 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measures. <u>http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/Qnet</u> <u>Tier3&cid=1163010421830</u>. Accessed June 7, 2017. 2. Dharmarajan K, Hsieh AF, Kulkarni VT, et al. 2015 Trajectories of risk after hospitalization for heart failure, acute myocardial infarction, or pneumonia: retrospective cohort study. BMJ (Clinical researched);350:h411

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure outcome is death from any cause within 30 days of the index admission date. As currently specified, we identify deaths for FFS Medicare patients, age 65 years and older, in the Medicare Enrollment Database (EDB).

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Not applicable

#### **0530 Mortality for Selected Conditions**

Number of in-hospital deaths for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI

hemorrhage (separately). See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

#### **Denominator Statement**

## 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 18 years or older. We have explicitly tested the measure in both age groups.

The cohort for the publically reported measure includes admissions for patients aged 65 years and older discharged from the hospital with a principal discharge diagnosis of HF and with a complete claims history for the 12 months prior to admission. The measure is currently publicly reported by CMS for those patients 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.

Additional details are provided in S.7 Denominator Details.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The cohort includes inpatient admissions to all non-federal, short-term, acute care hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

Additional details are provided in S.9 Denominator Details.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Discharges, for patients ages 18 years and older or MDC 14 (pregnancy, childbirth, and puerperium), with a low-mortality (less than 0.5% mortality) MS-DRG code (LOWMODR). If an MS-DRG is divided into "without/with (major) complications and comorbidities," both codes without complications/comorbidities and codes with (major) complications/comorbidities must have mortality rates below 0.5% in the reference population to qualify for inclusion.

#### **0530 Mortality for Selected Conditions**

Number of eligible discharges (all indicators are limited to the adult population)

### **Denominator Details**

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission

Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.

2. Not transferred from another acute care facility

Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

3. Aged between 65 and 94 years

Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.

Note that the hybrid measure (submitted for NQF endorsement in parallel with the claimsonly measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

4. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

#### 5. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.

7. Not enrolled in hospice within two days of admission

Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

9. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare

Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

## 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

To be included in the HF measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Have a principal discharge diagnosis of heart failure (HF);

2. Enrolled in Medicare Fee-For-Service (FFS)Part A and Part B for the 12 months prior to the date of the index admission and Part A during the index admission, or those who are VA beneficiaries (in the cases of the AMI, HF, and pneumonia measures);

3. Aged 65 or over; and,

4. Not transferred from another acute care facility.

VA beneficiaries are eligible for inclusion in the AMI, HF, and pneumonia measure cohorts regardless of Medicare FFS enrollment or whether they were hospitalized in a VA or non-VA short-term acute care hospital.

This measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years.

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The denominator includes all Medicare FFS beneficiaries, age 65 and over, with a principal discharge diagnosis of acute ischemic stroke. To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Enrolled in Medicare fee-for-service (FFS) during the index admission;

2. Not transferred from another acute care facility; and

3. Enrolled in Part A and Part B Medicare for the 12 months prior to the date of index admission.

ICD-9-CM codes that define the patient cohort:

433.01 Occlusion and stenosis of basilar artery with cerebral infarction

433.11 Occlusion and stenosis of carotid artery with cerebral infarction

433.21 Occlusion and stenosis of vertebral artery with cerebral infarction

433.31 Occlusion and stenosis of multiple and bilateral precerebral arteries with cerebral infarction

433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction

433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral infarction

434.01 Cerebral thrombosis with cerebral infarction

434.11 Cerebral embolism with cerebral infarction

434.91 Cerebral artery occlusion, unspecified with cerebral infarction

436 Acute, but ill-defined, cerebrovascular disease

ICD-10 codes that define the patient cohort:

163.22 Cerebral infarction due to unspecified occlusion or stenosis of basilar arteries

163.139 Cerebral infarction due to embolism of unspecified carotid artery

I63.239 Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries

163.019 Cerebral infarction due to thrombosis of unspecified vertebral artery

163.119 Cerebral infarction due to embolism of unspecified vertebral artery

I63.219 Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries

163.59 Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery

163.20 Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries

163.30 Cerebral infarction due to thrombosis of unspecified cerebral artery

163.40 Cerebral infarction due to embolism of unspecified cerebral artery

163.50 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery

- 167.8 Other specified cerebrovascular diseases
- 167.89 Other cerebrovascular diseases

An ICD-9 to ICD-10 crosswalk is attached in field S.2b. (Data Dictionary or Code Table).

### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

LOWMODR: Low-mortality (less than 0.5%) MS-DRG codes

(See attached technical specifications for detailed list of codes.)

#### **0530 Mortality for Selected Conditions**

Number of eligible adult discharges for CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI

hemorrhage (separately).

See Inpatient Quality Indicators: Technical Specifications for additional details (http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

#### Exclusions

## 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;

2. Discharged against medical advice (AMA);

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The HF mortality measure excludes index hospitalizations that meet any of the following exclusion criteria:

1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;

2. Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission; or,

3. Discharged against medical advice.

4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility; or

5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission.

For patients with more than one admission for a given condition in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure excludes admissions for patients:

1. With inconsistent or unknown vital status or other unreliable data;

2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission; and

3. Discharged against medical advice (AMA).

For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Exclude cases:

- with any listed ICD-10-CM diagnosis codes for trauma (Appendix G: TRAUMID)
- with any listed ICD-10-CM diagnosis codes for cancer (Appendix H: CANCEID)
- with any listed ICD-10-CM diagnosis codes for immunocompromised state (Appendix I: IMMUNID)

• with any listed ICD-10-PCS procedure codes for immunocompromised state (Appendix I: IMMUNIP)

• transfer to an acute care facility (DISP=2)

• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing)

#### **0530 Mortality for Selected Conditions**

Indicator specific

#### **Exclusion Details**

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data

Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240)

Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

### 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

1. Inconsistent or unknown vital status or other unreliable demographic data

Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male'

Rationale: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

2. Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission

Rationale: Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient standard analytic file (SAF). This exclusion applies when the measure is used in Medicare FFS patients only.

Rationale: These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care.

3. Discharged against medical advice

Discharges against medical advice are identified using the discharge disposition indicator.

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

4. Discharged alive on the day of admission or the following day who were not transferred to another acute care facility. The discharge disposition indicator is used to identify patients alive at discharge. Transfers are identified in the claims when a patient with a qualifying admission is discharged from an acute care hospital and admitted to another acute care hospital on the same day or next day.

Rationale: It is unlikely that these patients had clinically significant HF.

5. With a procedure code for LVAD implantation or heart transplantation either during the index admission or in the 12 months prior to the index admission

Patients with LVAD implantation or heart transplantation during an index admission or in the previous 12 months are identified by the corresponding codes for these procedures included in claims data.

Rationale: These patients represent a clinically distinct group (ICD-10-PCS code list).

The data sources for these analyses are Medicare administrative claims and enrollment information for patients with hospitalizations between July 1, 2013 and June 30, 2016.

After exclusions #1-5 are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. Additional admissions within that year are excluded. For each patient, the probability of death increases with each subsequent admission and therefore the episodes of care are not mutually independent. For the three-year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

1. Inconsistent vital status or unreliable data: We do not include stays for patients where the age is greater than 115, where the gender is neither male nor female, where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the Inpatient Standard Analytic File (SAF). These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care for these patients.

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator. After all exclusions are applied, the measure randomly selects one index admission per patient per year for inclusion in the cohort so that each episode of care is mutually independent with the same probability of the outcome. For each patient, the probability of death increases with each subsequent admission, and therefore, the episodes of care are not mutually independent. Similarly, for the three year combined data, when index admissions occur during the transition between measure reporting periods (June and July of each year) and both are randomly selected for inclusion in the measure, the measure includes only the June admission. The July admissions are excluded to avoid assigning a single death to two admissions.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Appendix G: Trauma Diagnosis Codes

Appendix H: Cancer Diagnosis Codes

Appendix I: Immunocompromised State Diagnosis and Procedure Codes

(See attached Appendix G, Appendix H, and Appendix I for detailed list of codes.)

#### **0530 Mortality for Selected Conditions**

See Inpatient Quality Indicators: Technical Specifications for additional details (available at

http://www.qualityindicators.ahrq.gov/Modules/IQI\_TechSpec.aspx).

#### Risk Adjustment

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Statistical risk model

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Statistical risk model

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Statistical risk model
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

No risk adjustment or risk stratification

### **0530 Mortality for Selected Conditions**

No risk adjustment or risk stratification

### Stratification

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

N/A

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

N/A

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity N/A
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Not applicable

**0530 Mortality for Selected Conditions** 

### Type Score

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

Rate/proportion better quality = lower score

0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

Rate/proportion better quality = lower score

- 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity Rate/proportion better quality = lower score
- 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02) Rate/proportion better quality = lower score

### **0530 Mortality for Selected Conditions**

#### Algorithm

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse varianceweighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

The measure estimates hospital-level 30-day all-cause RSMRs following hospitalization for HF using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific effect is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are log transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are log transformed and summed over all patients are log transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Krumholz et al., 2005). References:

1. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

2. Krumholz H, Normand S, Galusha D, et al. 2005. Risk-Adjustment Models for AMI and HF 30-Day Mortality Methodology.

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

The measure estimates hospital-level, 30-day, all-cause RSMRs following hospitalization for stroke using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are transformed and summed over all patients attributed to a hospital to get a predicted value. The "expected" number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report (Grosso et al., 2011).

#### References:

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

Risk adjustment is not currently included in the ICD-10-CM/PCS v2018 of the AHRQ QI specifications, due to the transition to ICD-10-CM/PCS (October 1, 2015). At least one full year of data coded in ICD-10-CM/PCS is needed in order to develop robust risk adjustment

models. A full year of ICD-10-CM/PCS coded all-payer data will not be available until mid-2019. AHRQ will announce an anticipated date as soon as one is known.

#### **0530 Mortality for Selected Conditions**

#### Submission items

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore, are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into, to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into five categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. Hospital-wide mortality captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures inhospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value: There are no competing NQF-endorsed measures.

# 0229 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization

5.1 Identified measures: 0358 : Heart Failure Mortality Rate (IQI 16)

1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization

0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization

1891 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization

1551 : Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization

0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.

1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (e.g., process) measures with the same target population as our measure. Our measure cohort was heavily vetted by clinical experts, a technical expert panel, and a public comment period. Additionally, the measure, with the specified cohort, has been publicly reported since 2008. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure).

5b.1 If competing, why superior or rationale for additive value: N/A

# 2876 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

5.1 Identified measures: 0467 : Acute Stroke Mortality Rate (IQI 17)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: We did not include in our list of related measures any non-outcome (such as process) measures with the same target population as our measure. Because this is an outcome measure, clinical coherence of the cohort takes precedence over alignment with related non-outcome measures. Furthermore, non-outcome measures are limited due to broader patient

exclusions. This is because they typically only include a specific subset of patients who are eligible for that measure (for example, patients who receive a specific medication or undergo a specific procedure). Additionally, this measure and the NQF endorsed Acute Stroke Mortality Rate (IQI 17) (AHRQ) Measure #0467 are complementary and related rather than competing measures. Although they both assess mortality for patients admitted to acute care hospitals with a principal discharge diagnosis of acute ischemic stroke, the specified outcomes are different. Our measure assesses 30-day mortality, while #0467 assesses inpatient mortality. The 30-day mortality and inpatient mortality outcomes each have distinct advantages and uses, which make them complementary (and related) as opposed to competing. For example the 30-day period provides a broader perspective on hospital care and utilizes a standard time period to examine hospital performance to avoid bias by differences in length of stay among hospitals. However, in some settings it may not be feasible to capture post-discharge mortality, making the inpatient measure more useable. We have previously consulted with AHRQ to examine harmonization of the measures' cohort. As a result of that collaboration, we have found that the measures' cohorts are harmonized to the extent possible and that the small differences in cohort inclusion and exclusion criteria are appropriate because the measures assess different outcomes.

5b.1 If competing, why superior or rationale for additive value: This measure looks at a longer outcome time frame (30-days versus in-hospital) and incorporates stroke severity into the risk-model.

The current publicly reported measure, Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalization Measure, is a potentially competing measure. It is CMS intent to replace the current measure in any given program with this newly developed measure, which includes stroke severity in the risk model.

The Hybrid Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke with Risk Adjustment for Stroke Severity measure is also being submitted to NQF for endorsement. This measure uses a combination of claims and electronic health records (EHR) data for risk adjustment but is otherwise harmonized with the new claims-only measure. It is CMS intent to implement only one of the new stroke mortality measures (this claims-only measure or the hybrid measure) in any given program.

#### 0347 Death Rate in Low-Mortality Diagnosis Related Groups (PSI02)

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact: not applicable

5b.1 If competing, why superior or rationale for additive value: Not applicable

#### **0530 Mortality for Selected Conditions**

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact:

5b.1 If competing, why superior or rationale for additive value:

# **Appendix F: Pre-Evaluation Comments**

Comments received as of June 5, 2019.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Jelena Svircev, Physician

The NQF is to be commended for this medication to Quality Improvement in health care, as well as a strong commitment to patient–centeredness, consensus–building, and protection of vulnerable populations. Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and places patient's an undue risk of life–threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and transition from hospital to home. Furthermore, the benefit of reducing Foley–related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guidelines–driven principles, it is unreasonable to require the healthcare providers for this small patient population produce definitive proof of harm from a quality measure for a careful analysis of risk and benefits is done.

As a healthcare professional who cares for patients with SCI, I'm requesting that the NQF work to create better alignment between the financial incentives and SCI–specific recommendations in evidence–based clinical practice guidelines.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Ms. Sarah Nichelson, JD, Association of Rehabilitation Nurses

ARN has previously commented the CAUTI Outcome Measure, joining with the American Spinal Injury Association, United Spinal Association, and Academy of Spinal Cord Injury Professionals, in a December 11, 2017 letter requesting additional studies from acute care hospitals in bladder management in SCI. ARN expressed concern that non-specialty hospitals would not have the requisite competency in dealing with conditions like neurogenic bladder.

ARN is still in agreement with the December 11, 2017 letter we submitted. We respectfully request additional data collection from SCI centers with direct oversight from the NQF in order to continue to study the CAUTI Outcome Measure.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Jeffrey Craig Berliner

I am both supportive and applaud Matt Davis for his efforts and advocacy to exclude the diagnosis of spinal cord injury/Neurogenic bladder from Quality Measure 0138 to allow for the proper care of spinal cord injured patients. I have been involved in the care of patients with spinal cord injury both in the ICU and acute rehabilitation settings for over a decade, and after the "pay for performance" model arrived I have noticed an increase in the inappropriate care of the bladder of persons with spinal cord injury in

efforts to comply with guidelines. I believe that this is diametrically opposite to best practices and best patient care as outlined below in SCI guidelines. I have witnessed the deleterious results and damage to the urological system when physicians directly try to keep to this guideline without understanding the ramifications on the patient and patient population. The benefit of earlier catheter withdrawal has merits in many patient populations but I am hopeful that the NQF will see that a one size fits all policy may not only be ineffective for the neurogenic bladder but does cause harm for this specific patient population.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

# Submitted by Dr. Matthew Davis, MD, American Spinal Injury Association, Academy of SCI Professionals

I am submitting this letter electronically in order to remind the Committee of the letter we sent last year. This letter was signed by representatives from professional societies of virtually every healthcare discipline that works with SCI, and we have asked for a thorough, transparent review of the risks and benefits of including them in this current form of surveillance. You will see that 7 of the 10 organizations represented here are also institutional members of the NQF.

RE: NQF Measure 0138 and patients with Spinal Cord Injury

Dear Dr. Agrawal and Ms. Munthali:

On behalf of the undersigned interdisciplinary organizations representing individuals with spinal cord injuries (SCI) and the professionals (physicians, researchers, nurses, therapists and mental health professionals) who care for them, we are requesting that the NQF conduct a review of the risks and benefits of Quality Measure 0138 for SCI patients and consider downgrading it to conditional endorsement status.

In the spring of 2014, care providers of patients with SCI reported a surge in unsafe bladder management practices soon after the transition toward "Pay for Performance" status of the National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure. These practices include indiscriminate removal of Foley catheters in non-specialty hospitals, with little understanding of the importance of intermittent catheterization volumes, patient independence, bladder compliance, and overflow incontinence in SCI patients. This incomplete understanding has led to undiagnosed Autonomic Dysreflexia (AD) and UTIs related to bladder overdistension and retained urine. Bladder overdistension is the leading cause of AD,[1] which leads to hypertensive emergency and potentially life-threatening consequences. Understanding of the recognition and treatment of AD has been shown to be quite limited among non-specialty healthcare providers,[2,3,4] and we have data from a Level I trauma center demonstrating 57% of intermittent catheterization volumes exceeding the maximum recommended by published guidelines. These patients demonstrated blood pressures consistent with AD.

SCI providers also raised concerns about the validity of this measure's definition of UTI for these patients. The NHSN definition of UTI includes symptoms of suprapubic tenderness, flank pain, and fever. SCI patients typically have impaired sensation in the suprapubic and flank areas, and thermoregulation is altered in this patient group.[5] Hence, we have reason to believe that the benefits of this particular type of surveillance have been overestimated for SCI, as demonstrated by a poor sensitivity (42%) and a high false-positive rate (58%) for the NHSN definition of UTI in SCI patients seen in data from an SCI center. This unpublished data corroborates the findings of previous published work.[6,7]

It is well established that the duration of indwelling catheterization is directly related to risk for developing UTI. Therefore, expeditious Foley removal is a mainstay of CAUTI prevention,[8,9] and is one of the most evidence-based strategies hospitals can use to reduce their CAUTI Standardized Infection Ratio. Since Quality Measure 0138 is included in Medicare's Quality Reporting and Value-Based Purchasing programs, and is subject to public reporting through Medicare's Hospital Compare website, non-specialty hospitals now have financial and public reporting incentives to remove Foleys and assume care over neurogenic bladder in SCI – a competency which is not widely taught outside of SCI centers.

Soon after we raised our concerns in 2014, the NQF connected us with the measure developers, for which we are grateful. We arranged for two separate informal phone conferences between the measure developers and some highly-respected members of the SCI academic community. These discussions did not occur with NQF oversight, and we did not reach any mutually satisfactory conclusions. To our knowledge, no minutes were taken at these meetings. Furthermore, subsequent Measure Summaries submitted to the NQF by the measure developers contained no mention of our concerns in section 4c – the section concerning "unintended consequences to individuals or populations." This informal process lacked the organized structure, transparency, and accountability that is characteristic of the NQF.

When SCI providers approached the Joint Commission with similar concerns regarding their CAUTI National Patient Safety Goal (NPSG), the Joint Commission assigned two people to conduct an investigation, meet with SCI experts, and produce a written report. The findings of this investigation culminated in changes to the CAUTI NPSG that acknowledge these safety concerns and recognize the important role that indwelling catheters play in safely managing SCI neurogenic bladder.

Despite the changes to the CAUTI NPSG that took effect last January, the problems our members are seeing in acute care hospitals continue unabated, and financial incentives remain unchanged. We believe this issue is worth revisiting – this time with data that has been collected from SCI centers. This time, however, we are requesting the direct oversight and wisdom of the NQF, along with its characteristic organization, transparency, and accountability.

We hope that you agree that this situation merits a more structured approach. We are open to any intervention that

addresses our concerns about patient safety, that conforms with Clinical Practice Guidelines regarding selection of

bladder management method, [10] and that has a reasonable chance of success. This could include the development of an alternative quality measure that more specifically addresses quality of care in bladder management in SCI. If you have further questions or wish to reply to this letter, please feel free to reach out to Dr. Matthew Davis, who serves as the chair of the advocacy committees of ASIA and ASCIP and who has been involved in this issue from the beginning.

Sincerely, [co-signers listed below] Keith Tansey, MD, PhD President American Spinal Injury Association Jeffrey Johns, MD President Academy of Spinal Cord Injury Professionals Matthew Davis, MD Chair, ASIA HPAC Vice President, Government Relations

Chair, ASCIP Advocacy Committee United Spinal Association

Alexandra Bennewith, MPA

Vice President, Government Relations

Supporting Organizations:

William J. Maloney, MD

President

American Academy of Orthopaedic Surgeons

Scott Laker, MD

Chair, Quality, Practice, Policy and Research Committee

American Academy of Physical Medicine & Rehabilitation

Neil Harvison, PhD, OTR/L, FAOTA

Chief Professional Affairs Officer

American Occupational Therapy Association

Katy Neas, APTA

**Executive Vice President of Public Affairs** 

American Physical Therapy Association

J. Stuart Wolf, MD

Chair, Science & Quality Council

American Urological Association

John Chae, MD

President

Association of Academic Physiatrists

Karion Gray Waites, DNP FNP-BC MSN RN CRRN

President

Association of Rehabilitation Nurses

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# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### **Submitted by Stephen Burns**

Based on my experience practicing as an SCI Medicine physician for 23 years, providing care to patients with acute and chronic SCI, I have concerns about inappropriate discontinuation of indwelling urinary catheters. An indwelling catheter is sometimes the most appropriate option for long-term management of neurogenic bladder. This is particularly true when a patient with tetraplegia and limited hand function would be dependent on others to perform intermittent catheterization. This adds an extra burden of caregiver assistance that must be available at various times throughout the day and night. This need for care is a potential barrier to employment or school, whereas most patients with indwelling catheters can be independent for 8 or more hours before needing to empty a urinary collection bag. In the SCI population with neurogenic bladder dysfunction, the benefits of intermittent catheterization over indwelling catheters are minimal at best (urethral complications), and intermittent catheterization introduces other risks and greatly increases the chances of urinary incontinence which negatively affects quality of life. Research performed by myself and colleagues at the University of Washington demonstrates that 20% of individuals with SCI who use intermittent catheterization experience urinary incontinence weekly or more frequently (Stillman M, Hoffman J, Barber J, Williams S, Burns SP. Bladder management and related complications after spinal cord injury over the first year after discharge from inpatient rehabilitation. Spinal Cord Case Series 2019 [in press; accepted 28 sept 2019]). Incontinence is frequently a barrier to participation in community activities. Intermittent catheterization in this population has not been demonstrated to have a lower risk of urinary tract infections, and a large percentage of people with SCI who perform intermittent catherization have chronic colonization of the bladder with bacteria. Risks of renal stones and bladder cancer are also not significantly different between patients with SCI using indwelling vs. intermittent catheterization. The big push to discontinue

indwelling catheters, leaving patients with inadequate bladder drainage, has negatively affected patients with acute and chronic SCI who I have treated. There is potential to cause renal failure when catheters are inappropriately removed. Due to the high prevalence of asymptomatic bacteriuria in this population, plus the potential for negative consequences on health and quality of life if a catheter is inappropriately removed, it would be most appropriate for patients with SCI and neurogenic bladder dysfunction to be excluded from any quality measure involving indwelling catheters. These statements are in alignment with clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. As a healthcare professional who treats patients with acute and chronic SCI, I am requesting that NQF work to create better alignment between the financial incentives and SCI-specific recommendations in evidence-based clinical practice guidelines.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Rita G. Hamilton

as an SCI physician in a freestanding rehab facility affiliated with a level 1 trauma center we see a number of acute SCI injuries admitted to our facility - unfortunately the ones with acute renal failure as an additional diagnosis - due to the Foley being removed in the acute hospital are upsetting to all of us that practice SCI medicine - as I type this we have one such example currently in our hospital now - and this is not uncommon to this population with the CAUTI measures as they are written currently - while I agree with removing indwelling catheters to prevent infections etc.- I would strongly urge you to reconsider the Spinal Cord Injury population - - the neurogenic bladder is a special diagnosis - and should be treated as such - I applaud Dr. Matt Davis and his efforts addressing this issue.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Malorie Heinen

Our hospital is very adament about removing indwelling catheters early in-patient care and do not want to have them if possible due to the risk of having a CAUTI and a documented CAUTI at that. As a nurse that works primarily with patients with a spinal cord injury, I witness many issues in the acute phase of care with the catheter being removed. Patient's with neurogenic bladder should not be under the same umbrella of care as those with temporary retention issues or non-neurogenic needs.

The current issue that I run into is that the catheters are removed very early in care due to the CAUTI outcome measure tracking but most of our services are not familiar enough with neurogenic bladder in order to have a proper management plan in place to follow the removal. We have a new urinary catheter removal protocol and algorithm, but it is still new and requires that a "plan" be made at the 24 hr. mark post removal. Most times an adequate bladder management plan is not made or catheters are being replaced and then removed again, or an intermittent straight catheter schedule may be started but not written appropriately.

I try to advocate for these patients to keep their catheters in place if they are not going to be able to be independent in their own bladder management plan, if they are still in the acute phase of recovery (on the vent, in ICU with fluids being given, etc.) and if they are just not mentally ready to tackle this new life change so early in a traumatic injury. Patients with higher levels of injury are also at risk for Autonomic Dysreflexia and by removing these catheters in patients who cannot manage their own bladders, we are putting them at significant risk for harm. The biggest argument I receive for removing catheters is the risk of CAUTI's. This patient population should not be in the same outcome measure bundle as the rest of the population. I believe we do these patient's more harm than good by having them in this bundle.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Ms. Heather Smith, PT, MPH, American Physical Therapy Association

APTA does support this measure, however, we believe that NQF and the CDC should modify this measure to exclude patients with spinal cord injury. Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and place patients at undue risk of life-threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and transition from hospital to home. Furthermore, the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guideline-driven principles, it is unreasonable to require that healthcare providers for small patient populations produce definitive proof of harm from a quality measure before a careful analysis of risks and benefits is done.

As a healthcare profession who cares for patients with SCI, we are requesting that the NQF work to create better alignment between the financial incentives and SCI-specific recommendations in evidence-based clinical practice guidelines.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Dr. E. Clarke Ross, DPA

The American Association on Health and Disability and the Lakeshore Foundation encourage the NQF to review the risks and benefits of existing and proposed modifications to the CAUTI measure #0138. There appears to be consensus among the three national associations focused on persons with spinal cord injury regarding the approach to CAUTI. Matt Davis, M.D., University of Texas Health Science Center at Houston works closely with these 3 national associations as well as numerous rehabilitation professionals, and has previously submitted comments. Thank you for your consideration. Clarke Ross for both AAHD & Lakeshore Foundation

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Stephen McKenna, M.D.

The CDC has a straight forward mechanism to improve the CAUTI standard by removing Spinal Cord Injury (SCI) from aggregated data. There is precedent for this improvement in that the CAUTI accreditation standards for the Joint Commission have removed SCI from aggregate reporting. I would encourage the CDC to be open to input from that community of clinicians who have witnessed specific harm arising from the CAUTI standard in the subset of patients with SCI. The failure of the CDC is to recognize that CAUTI data does not quantify the danger of urinary catheters equally across all populations. This is particularly concerning for rare diseases with different pathophysiology such as Spinal Cord Injury. The CDC has created an unfunded mandate to adopt an objectively dangerous standard for patients with rare neuromuscular diseases. Hospitals are forced to disclose aggregated CAUTI cases for disease conditions such as SCI which they may encounter less than once per year in a specific acute trauma unit. For the individual hospital, the resources required to appropriately manage patients with SCI related neurogenic bladder do not rise to the level of significance necessary to drive universal competency. However, for the individual with SCI removal of the catheter often spells acute renal insufficiency and occasionally death. The CDC should acknowledge that aggregated reporting of CAUDI is causing harm to patients with SCI and remove this condition from the current CAUTI reporting requirements.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Kathy Hulse, Craig Hospital

As a social worker in the outpatient setting, I focus on helping patients adapt to life outside of the hospital. Before they can return to work or school, they need to be able to independently manage their bladder. Intermittent catheterization is not practical in some circumstances due to clothing management, hand function, availability of attendant care or financial resources. Removal of the Foley can force dependence on patients when we are trying to teach them independence in the community.

I have several co-workers and patients working in the community that would be unable to maintain their current jobs without the use of an indwelling catheter in the workplace setting. They are tax-paying members of society, rather than being reliant on Social Security.

Our goal in rehabilitation is to support the transition to the next phase of their "new normal". Quality of life includes being able to independently manage your bladder as much as possible.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by James Crew, Jr.

Thank you, Dr. Davis, for your efforts in this area, and for your commitment to advocating for those with Spinal Cord Injury (SCI). As someone who practices at a tertiary care center, I routinely consult on acute SCI patients in the ICU and admit patients with SCI to our inpatient rehabilitation facility. I am quite sympathetic to this issue. Since CAUTIs have become a quality metric for inpatient care, I have noticed a trend toward the use of condom catheters for patients with SCI and neurogenic bladder who are transferred to our hospital. We have seen cases of autonomic dysreflexia and renal insufficiency from this practice. While it is important to minimize UTI risk, I would advocate for a more sophisticated approach in the care of SCI patients without volitional bladder control who are subsequently at high risk for bladder spasticity, autonomic dysreflexia, and renal deterioration if Foleys are removed without an appropriate bladder management strategy such as intermittent bladder catheterization (which is often not practical given high urine output volumes acutely after SCI, as well as a lack of feasibility for RN staff at most hospitals to perform intermittent caths every 4 hours). Hopefully, the CAUTI dilemma in SCI can be seen as an opportunity for policy-makers to guide appropriate clinical practice.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Dr. Lance Goetz

Based on my 23 years as a spinal cord injury (SCI) medicine physician and my 35 years as a person with SCI, I concur with the comments from other SCI professionals. Indwelling catheters, while not our first choice, are sometimes the only viable option for certain subgroups of persons with SCI and some other causes of neurogenic bladder dysfunction. Removal of an indwelling catheter and placement of an external or "condom" catheter can put such persons at risk for a number of serious complications, including vesicoureteral reflux due to bladder outlet obstruction, leading to renal stone disease and/or kidney and upper urinary tract structural damage.

The SCI literature does not demonstrate evidence of superiority of intermittent catheterization in persons who require a caregiver to perform the technique. In fact, outcomes may be worse in this scenario, and quality of life, freedom and mobility can be hampered.

Further, insistence on intermittent catheterization could cause persons with SCI to be denied admission to health care facilities.

I recommend allowing justification of indwelling catheter use or making other accommodations for these persons.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Jennifer Villacorta

I have been fortunate enough to be recruited and serve in a facility that provides the only acute inpatient rehab for catastrophic diagnoses as SCI in the state of MS. It has not been uncommon to receive referrals and admissions for SCI patients who have been told and felt that they have been voiding on their own since their indwelling had been removed in acute care, only to realize that their 'spontaneous void' is the the result of overflow -- retaining a significant amount of urien that may eventually transform into frequent infections, pain (with bladder distention), and as stated in our advocacy statement, RENAL FAILURE. It is certainly scary to realize that many more patient have probably been sent home with the same perception and come back re-hospitalized as a result of inadequate screening (bladder scan or at least a referral to urology) prior to discharge clearance.

I full heartedly support this advocacy program for more education and re-considerations for practices of a more inclusive bladder management practice for our spinal cord population patients.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Ms. Beth Radtke, AAPMR

The NQF is to be commended for its dedication to Quality Improvement in healthcare, as well as its strong commitment to patient-centeredness, consensus-building, and protection of vulnerable populations. Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and place patients at undue risk of life-threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and

transition from hospital to home. Furthermore, the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

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# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

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# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Chloe Slocum, Physician

I support NQF's efforts to hold health care providers and health systems accountable for patient outcomes, but respectfully recommend the NQF include spinal cord injury consumers, providers, and professional organizations in the guideline development and revision process to identify whether this population may contain legitimate sub-groups that would qualify for an exception based upon best practice guidelines used in the field currently that are based upon the best possible medical knowledge of this unique population. For instance, some individuals who have selected a suprapubic catheter for bladder management may have to wait as an inpatient until this procedure is performed due to issues of access, scheduling, or medical stability (e.g. anticoagulation adjustment). An indwelling urethral catheter would be clinically appropriate until a suprapubic catheter could be placed for an individual who has had

impaired kidney function and/or refractory autonomic dysreflexia caused by bladder distension in order to avoid elevated hydrostatic pressures in the bladder that may trigger autonomic dysreflexia or kidney injury. Yet, such a clear algorithmic approach based on an individual's clinical needs may be abrogated by the incentives created with broad application of the NQF measure across clinically diverse populations that currently include people with spinal cord injury. Thank you for the opportunity to comment and contribute to the NQF Outcome Measure process.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Adele Henry, Physical Therapist

The management of the neurogenic bladder following spinal cord injury has significant impact to the overall patient's health, quality of life, and functional independence. Achieving the best clinical and functional outcome should be paramount when clinical decision making in this area occurs. Patient outcomes should be the primary consideration for medical management of the neurogenic bladder - not generalized rules that do not focus on the unique clinical needs of patients with neurogenic bladder following spinal cord injury. Spinal Cord Injured patients must have their bladders managed with a holistic approach. Often, the Foley is removed without consideration related to caregiver availability, functional independence, and risk of secondary complications including autonomic dysreflexia. I like to say that spinal cord injuries are like snowflakes - no 2 are alike. In the same way - no two neurogenic bladders are alike. Please allow medical professionals to utilize their specialized training to ensure appropriate medical management of the neurogenic bladder. Please do not encourage facilities to discontinue the use of a Foley catheter when they do not have a plan to manage the neurogenic bladder effectively. Patient's deserve the opportunity to make informed decisions after consulting with their primary medical team. Often times, a Foley catheter provides increased independence, ability to be away from the home for >4 hours, allows return to work or school.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Marcie Kern

Foley catheter removal in patients with neurogenic bladder due to spinal cord injury can have extremely negative consequences on genitourinary system health and function and place individuals at undue risk of life threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life and transition from hospital to home. Furthermore, the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guideline driven principles, it is unreasonable to require healthcare providers for small patient populations to produce definitive proof of harm from a quality measure before a careful analysis of risks and benefits is done.

As a healthcare professional who works daily with individuals with spinal cord injury I have seen the impact on quality of life when we allow for bladder management solutions that work for the individual. For example, the teenager who doesn't have the hand function and trunk control to perform clothing management and self-intermittent catheterization who has a Foley and is now able to independently go

off to college because they do not need mom or caregiver to assist them to the bathroom and perform intermittent catheterization throughout the day. Or the mom or whose pair shape and short weak arms limits her independence with transfers and clothing management to be able to perform self-catheterization who, with a Foley, is able to independently stay at home and care for her toddler since she doesn't need a caregiver to assist her with toileting every 4 hours. Or the individual who did not have resources to hire a caregiver who was able to stay home safely and independently during the day while their spouse went to work to support the family because they had a Foley to manage their bladder. Or the patient with a high-level spinal cord injury who had no hand function or ability to manage their bladder and who relied on a caregiver (their spouse) to perform 100% of their self-care needs. Having a Foley reduced the burden on the caregiver to allow for more time to perform other daily care needs and allowed them the freedom to more easily leave their home and not be tied to a 4-hour catheterization schedule. And the list goes on. Every person with a spinal cord injury has a unique situation. And removal of a Foley is not always the best bladder management method. For some, removal of the Foley increases the burden of care, cost of care, risk of autonomic dysreflexia and even death.

I and my colleagues and our patients are requesting the NQF work to create better alignment between the financial incentives and spinal cord injury specific recommendations in evidence based clinical practice guidelines.

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## Submitted by Kathryn Nedley

Monitoring of CAUTI outcomes is vital to the overall health and well-being of all patients currently served by our medical system, and the NQF is a leader in developing patient-centered practices. While developing these patient-centered practices, it is imperative to consider multiple populations, while maintaining awareness that some populations have more at stake than others. As an occupational therapist I work daily with patients on skills to increase their independence and quality of life, as well as ways they can maintain good health practices. For individuals with hand dexterity impairments, Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and place patients at undue risk of life-threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and transition from hospital to home. For individuals who are learning to complete "in and out" catheterization, there is increased difficulty maintaining a sterile environment, and therefore increasing risk of CAUTI which could be reduced by continuation of use of a Foley. One patient in particular has been injured for 3 years, learned to complete intermittent catherization, and whose health care needs have been managed through outpatient appointments. This gentleman has limited use of his hands, and while he completes intermittent catheterization, he has experienced a period longer than 6 weeks without UTI. During times where he has had a Foley catheter temporarily placed, his incidence of CAUTI was significantly reduced. This man's experience is an example of how the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guideline-driven principles, it is unreasonable to require that healthcare providers for small patient populations produce definitive proof of harm from a quality measure before a careful analysis of risks and benefits is done.

As a healthcare professional who cares for patients with SCI, I am requesting that the NQF work to create better alignment between the financial incentives and SCI-specific recommendations in evidence-based clinical practice guidelines.

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#### Submitted by Ellia Ciammaichella, DO, JD

I applaud the NQF's desire to encourage accountability and incentivize internal quality improvement efforts to reduce the number of hospital-acquired UTIs. This is done by applying measures through federal programs that affect funding and ultimately incentivize facilities to optimize their "bladder bundles."

Since measure #0138 is a voluntary consensus standard that is implemented into federal programs, the National Technology Transfer and Advancement Act of 1995 (NTTAA), Executive Orders 13563 and 12866, and the OMB Circular A-119: Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, revised 2016, apply. These documents outline: (1) the process of review and (2) the criteria of a voluntary consensus standards that are incorporated into federal programs (i.e. measure #0138).

In terms of the process of review:

1. Procedures should provide meaningful opportunity and involvement of stakeholders, including "experts in relevant disciplines," to participate in standards development; and

2. The decision-making process should be transparent, including disclosures of the "agency's interactions with technical committees and/or technical advisory groups involved."

In terms of criteria, measure developers must consider:

1. "Best available science" and reasonably obtainable information;

2. Maximizing benefits and minimizing risks (both quantitative and qualitative); and

3. Logical reasoning with quantitative and qualitative information, recognizing that some benefits and risks are difficult to quantify.

Unfortunately, the processes and criteria listed above may have fallen short for the spinal cord injury population. People with spinal cord injury (SCI) are a unique and small proportion of our population that suffer from neurogenic bladder, resulting in unique needs for chronic alternative bladder management strategies. The National Spinal Cord Injury Statistical Center recognizes the annual incidence of SCI as approximately 54 cases per million population in the U.S. with approximately 282,000 persons alive in 2016 who have SCI. (National Spinal Cord Injury Statistical Center, Facts and Figures at a Glance. Birmingham, AL: University of Alabama at Birmingham, 2016.) Thus, although a small proportion, the SCI population is particularly affected by the incorporation of measure #0138 into federal programs, but their needs have not been adequately considered in the measure development process.

First, the SCI community is not meaningfully represented in the process of review of measure #0138. I did not see any physiatrist, spinal cord injury specialist, or neuro-urologist included in Healthcare Infection Control Practices Advisory Committee (HICPAC), the Ex-officio Members, Liaisons, or expert reviewers. However, this could be rectified by including specialists of neurogenic bladder as expert reviewers such as physiatrists, spinal cord injury (SCI) specialists, and/or neuro-urologists. These specialists are intimately familiar with the nuances of neurogenic bladder and bladder of people with disabilities as they manage this on a regular basis. Moreover, the spinal cord injury specialty has long been studying the management of neurogenic bladder with eight English language clinical practical

guidelines throughout the world that are "robust in stating their scope and clearly presenting recommendations," with three scoring over 70% in methodological rigor. (Bragge P, Guy S, Boulet M, et. al. A systematic review of the content and quality of clinical practice guidelines for management of the neurogenic bladder following spinal cord injury. Spinal Cord. April 10, 2019.

https://doi.org/10.1038/s41393-019-0278-0). Physiatrists, SCI specialists, and neuro-urologists have the expertise to provide information on best available science as well as quantitative and qualitative information on the benefits and risks of measure #0138 as it applies neurogenic bladder management in SCI. Incorporating these specialists as expert reviewers is in line with both federal rules and NQF policy to gather all stakeholder groups.

Second, disclosure as it relates to how measure #0138 affects the SCI community has been limited. The American Spinal Injury Association, Academy of Spinal Cord Injury Professional, and the United Spinal Association submitted a joint letter on December 11, 2017, but there is no mention of the agency's interaction with these associations. Furthermore, in the most recent iteration of measure #0138,there is no explanation as to how considering the "proportion of admissions with traumatic and non-traumatic spinal cord dysfunction" in the denominator will minimize any unintended consequences. Therefore, I recommend including disclosures of the agency's interactions with the above associations and clearly explaining how these changes in the denominator statement will limit unintended consequences.

Third, I am unsure that this measure maximizes net benefits and minimizes risks (both quantitative and qualitative.) Executive Order 13563 and 12866 both require quantitative and qualitative review of the costs and benefits of the measure. This includes both inclusions and exclusions to the measure. The CDC acknowledged that, "for patients with spinal cord injury, very low-quality evidence suggested a benefit of avoiding indwelling urinary catheters." (2009 Guideline for Prevention of Catheter-Associated Urinary Tract Infections, p. 34). Had they been confident that the benefits of avoiding indwelling catheters in SCI outweighed the risks, a "Category IB" recommendation would be appropriate. (p10) Instead, this was assigned "Category II" recommendation, acknowledging the "tradeoff between clinical benefits and harms," and indicating a lack of certainty of net benefit. Category II recommendations are "not intended to be enforced." (p32). Thus, in using the Category II designation, it seems clear that in 2009 the CDC lacked confidence of a favorable risk/benefit ratio in avoiding indwelling catheters in the SCI population. Therefore, it seems it violates federal law and rules to implement measure #0138 into federal programs in its current form.

Furthermore, to minimize risks and to understand the qualitative costs, the unintended consequences must be tracked. This is a significant concern especially in SCI as urinary stasis and overdistended bladders have significant and sometimes irreparable damage to our patient population. Because of the uniqueness of the SCI population, I emphasize the need to include specialists in physiatry, SCI, and/or neuro-urology to participate as expert reviewers to provide further information about any possible unintended consequences that should be tracked. These side effects are the qualitative costs of implementing measure #0138 and should be measured.

Finally, in considering the potential risks posed to SCI patients, Executive Orders 13563 and 12866 require consideration of qualitative input. This recognizes that some costs are difficult to quantify or not reasonably obtainable. Many unsafe conditions because of early removal of indwelling catheters are not expected to manifest as adverse events until after hospital discharge, so it is unreasonable to limit measures of unintended consequences to only harm manifested during hospitalization. On the other hand, it may be costly for long range data collection on unintended consequences and thus, excluding SCI patients from measure #0138 may be practical. Likewise, patient-centered considerations about quality of life should be included in qualitative analysis. Furthermore, anecdotal reports of harm, near-misses, and strong potential for harm should carry weight in the decision-making process.

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In conclusion, measure #0138 does not meet the required processes of review and criteria of NTTAA, Executive Orders 13563 and 12866, and the OMB Circular A-119. This would eliminate measure #0138 from incorporation into federal programs. This is unfortunate, as the goal to reduce the number of hospital acquired UTI is important. To ensure that federal laws and rules are followed such that measure #0138 can be incorporated into federal programs and to improve our joint effort to maximize our patients' health, I recommend the following:

1. Include physiatrists, spinal cord injury (SCI) specialists, and/or neuro-urologists as expert reviewers;

2. Thoroughly and transparently review both the costs and benefits of excluding SCI patients from measure #0138 as has been done for pediatric cases and provide this information to the public so that stakeholders have an opportunity to meaningfully participate in the voluntary standard development process;

3. Thoroughly and transparently evaluate the costs and benefits of incentivizing the reduction of hospital-acquired symptomatic UTIs for all alternative bladder management strategies, including indwelling catheters, suprapubic catheters, condom catheters, and "in and out" catheterizations, with input from stakeholders and experts in the field so that stakeholders have an opportunity to meaningfully participate in the standard development process;

4. Include spinal cord injury as an example of an appropriate indication for indwelling urethral catheter; and

5. Monitor and study qualitative costs of any unintended consequences of measure #0138.

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#### Submitted by Daniel Luigi Santa Maira, Physician

The NQF is to be commended for its dedication to Quality Improvement in healthcare, as well as its strong commitment to patient-centeredness, consensus-building, and protection of vulnerable populations. Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and place patients at undue risk of life-threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and transition from hospital to home. Furthermore, the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured.

These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guideline-driven principles, it is unreasonable to require that healthcare providers for small patient populations produce definitive proof of harm from a quality measure before a careful analysis of risks and benefits is done.

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#### **Submitted by Ramiro Martinez**

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As a healthcare professional who cares for patients with SCI, I am requesting that the NQF work to create better alignment between the financial incentives and SCI-specific recommendations in evidence-based clinical practice guidelines.

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## Submitted by Michelle Brand Trbovich

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## Submitted by Ms. Suzanne Pope, MBA

The American Urological Association (AUA) is a globally-engaged organization with more than 22,000 members practicing in the United States and worldwide. AUA members represent the world's largest collection of expertise and insight into the treatment of urologic disease and provide invaluable support to the urologic community by fostering the highest standards of urologic care through education, research and the formulation of health policy.

The AUA writes to express concern with the CAUTI outcome measure which encourages the removal of Foley catheters in patients with neurogenic bladder due to Spinal Cord Injury (SCI). SCI patients represent a unique population that should be excluded from the measure, due to the potential negative outcomes of catheter removal for these particular patients. The AUA's white paper on Catheter-Associated Urinary Tract Infections: Definitions and Significance in the Urologic Patient specifically

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addresses the complexities associated with care for SCI patients and the risks regarding intermittent catheterization.

We are concerned about the quality of care for these vulnerable patients and recommend exclusion of these patients from the measure.

Thank you for the opportunity to provide feedback.

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## Submitted by Lisa A. Beck

The dedication of MQF's to quality healthcare is commended, especially during this interesting political times.

I am an advance practice registered nurse in the field of spinal cord injury. Indwelling catheterization is an important option for the management of the neurogenic bladder, especially if the individual has limited hand function or ability to perform self-intermittent catheterization from the wheelchair. In addition approximately to 40 to 60 % a persons with traumatic spinal cord injury, have a concurrent brain injury which can also make self-intermittent catheterization a difficult task to do efficiently to avoid complications such as missed catheterization resulting in urinary incontinence, skin integrity issues, and autonomic dysreflexia.

The CAUTI prevention initiative, including early removal of indwelling catheters, can cause detrimental healthcare issues for persons with spinal cord injury, especially those with levels T6 and above secondary to autonomic dysreflexia. If catheters are removed in settings where healthcare providers have minimal or no education regarding neurogenic bladder and spinal cord injury, person with spinal cord injury may experience bladder over distension if not placed on a timely intermittent catheterization regimen and fluid schedule. This requires consultation of spinal cord injury providers to assist in the management of the persons with spinal cord injury and neurogenic bladder to avoid long term complications such as renal failure, autonomic dysreflexia that can cause stroke or death.

Systematic guidelines have been produced by the Paralyzed Veteran's Association, written by specialists in the field of spinal cord injury and urology. I, as a healthcare worker in the field of spinal cord injury, recommend that NQF work to create better alignment between the financial incentives and SCI-specific recommendations available in the evidence-based clinical practice guidelines.

# 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

## Submitted by Suzanne Groah

First, let me commend NQF's dedication to quality improvement in healthcare.

The purpose of this comment is to support changes suggested by Dr Matthew Davis (with support from the American Spinal Injury Association, Advocacy Committee). As a clinician caring for people with spinal cord injury and a researcher studying urinary tract infection among people with spinal cord injury, it is important to consider the very different needs of this unique population. Because people with spinal cord injury largely have some degree of neurogenic bladder that requires some form of catheterization, indwelling urethral or suprapubic catheterization have a very important role. This is especially important for those with limited hand function and/or caregiver support, which may limit or preclude the use of intermittent catheterization, those with body habitus or other injuries that makes intermittent catheterization difficult or impossible, skin breakdown such that maintenance of dry/incontinence-free

skin is of utmost importance for healing, and other factors. In these (and other) situations, indwelling catheterization has an important role for these patients.

Moreover, a systematic review (with expert consensus), of which I was a lead author (Paralyzed Veterans of America Consortium Guideline) did NOT confirm that the risk of UTI is necessarily higher for a particular type of bladder management of neurogenic bladder (indwelling urethral versus intermittent urethral catheterization). Rather, our clinical experience supports this finding that innate factors and catheterization technique and care are important contributors to UTI risk.

In the past few years, with the CAUTI prevention initiatives leading to early removal of indwelling catheters, we (myself and colleagues) have seen detrimental effects in the SCI population. Very early urethral catheter removal in a patient with new neurogenic bladder requires significant time and attention to balance fluid intake with output, while avoiding incontinence (putting a patient at risk for skin breakdown), excessive urinary retention, and low pressures. I and others have seen firsthand the results of an inability to attend to ALL of the individual's genitourinary needs in this tenuous period, with resulting more frequent UTIs, kidney infections, renal failure and (potentially deadly) autonomic dysreflexia.

Due to the very unique and complex needs of patients with SCI (of whom the vast majority have neurogenic bladder), I recommend that NQF work to create better alignment between the financial incentives and SCI-specific recommendations available in the evidence-based clinical practice guidelines.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Sushil Singla, MD

The NQF is to be commended for its dedication to Quality Improvement in healthcare, as well as its strong commitment to patient-centeredness, consensus-building, and protection of vulnerable populations. Foley catheter removal in patients with neurogenic bladder due to Spinal Cord Injury (SCI) can have extremely negative consequences on genitourinary system health and function, and place patients at undue risk of life-threatening outcomes such as renal failure and autonomic dysreflexia. Additionally, Foley removal carries important implications regarding independence, quality of life, and transition from hospital to home. Furthermore, the benefit of reducing Foley-related UTIs is tempered by increased risk of UTIs due to intermittent catheterization, which go unmeasured. These complexities are acknowledged in clinical practice guidelines from the Consortium for Spinal Cord Medicine, the American Urological Association, and the CDC. Given these guideline-driven principles, it is unreasonable to require that healthcare providers for small patient populations produce definitive proof of harm from a quality measure before a careful analysis of risks and benefits is done. As a healthcare professional who cares for patients with SCI, I am requesting that the NQF work to create better alignment between the financial incentives and SCI-specific recommendations in evidence-based clinical practice guidelines.

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Dr. Matthew Davis, MD

As our healthcare system transitions toward value-based care, the NQF has been charged with maintaining a difficult balance between patient safety, patient-centered care, consensus-building, and

protecting vulnerable populations. This is a prodigious undertaking, and the NQF has shown a strong commitment. Any worthwhile change will meet resistance, and this transition is no exception.

Among the various groups clamoring for special consideration, how do we differentiate between those who are merely resistant to change and those who truly merit unique consideration? If we open the door to special treatment for one group, how do we close that door to other, less-deserving groups? These are important concerns that should not be taken lightly.

Following the CAUTI measure's transition to "pay for performance" status, healthcare providers for patients with Spinal Cord Injury (SCI) began reporting Patient Safety Events related to aberrant bladder management practices in facilities that lack expertise in SCI – where most of these patients begin their medical journey. We have also raised concerns about patient-centered care, quality of life, and measure validity for this population.

As the Patient Safety Standing Committee reviews this measure for re-endorsement, I am requesting that you consider this specific population in discussing each of the 5 Measure Evaluation Criteria:

1) Importance: Is there a reliable way to reduce CAUTIs in SCI patients without also adding risk? Given that we are not tracking UTIs related to intermittent catheterization, how confident are we that we're reducing overall UTI rates at all? How much room for improvement is really available for this population? Is that improvement worth the risk?

2) Reliability/Validity: How accurate is this definition of "UTI" for a population of chronicallycatheterized patients who have altered temperature regulation, lack sensation, and are susceptible to a variety of other infections? Would this definition of UTI be considered acceptable if we were considering using it in a study in to be published in an SCI journal?

3) Use: If SCI specialty-centers that exercise judicious, patient-centered catheter use are more likely to be penalized than hospitals that indiscriminately remove catheters, how accurately does this measure reflect Quality of Care and Accountability?

4) Usability: How do we track the effects of unintended consequences, the most serious of which would be expected to fully manifest after discharge? How confident are we that the benefits for this population outweigh the risks?

5) Comparison to Related Measures: The developers of NQF measure #686 excluded SCI patients due to concerns about patient safety and Autonomic Dysreflexia. Similarly, the CDC CAUTI guidelines contain special mention of SCI, acknowledge a trade-off between benefits and harms, and recommend non-enforcement in this population. How do we reconcile these differences with the incentives associated with the CAUTI measure in its current form?

There is no shortage of relevant, SCI-specific literature covering each of the above topics. We are eager to delve into this body of literature with you.

About Consensus: Last year, we submitted a letter requesting a review of Risks and Benefits of this current form of CAUTI surveillance for patients with SCI. This letter was cosigned by national organizations representing SCI patients and virtually every specialty healthcare discipline that cares for these patients clinically – including several organizational members of the NQF.

SCI presents unique challenges with bladder management, and the stakes are high if the bladder is not handled in a safe manner after the Foley is removed. Unfortunately, the non-specialty hospitals in which SCI patients begin their care are untrained in detecting, preventing, and treating these adverse events (no, a bladder scanner is not sufficient ...). These hospitals now have an incentive to take ownership over a complex process but lack an appreciation of its complexity, patient safety hazards, or implications on independence and quality of life.

Imagine, for a moment, that you visited a family member in the hospital and discovered that a surgery resident had performed an aneurism repair without an attending Cardiovascular Surgeon present. Imagine that this occurred in an operating room that lacked appropriate equipment and specialty surgical staff experienced in monitoring and managing the complications unique to that surgery. You have no way of knowing if the surgery was done well, whether any sequelae that occur after discharge might have been related to inadequate training, whether the Informed Consent form provided an accurate description of risks, benefits, and alternatives to surgery.

- We see an analogous process occurring for SCI patients in many settings today.

- We have a quality measure that gives high scores to hospitals that indiscriminately remove catheters and penalizes the hospitals that have sufficient expertise to understand independence and quality of life for SCI patients.

#### Change is hard.

Review of the literature is time-consuming and often confusing.

It's intimidating to consider opening the door to the uncertainty that accompanies the type of policy change we are requesting.

If we choose not to delve deeply into these uncomfortable issues, how can we be confident that small, under-represented patient populations with complex needs won't see more harm than good from this system of Quality Measures?

## 0138: National Healthcare Safety Network (NHSN) Catheter-associated Urinary Tract Infection (CAUTI) Outcome Measure

#### Submitted by Dr. Jeremy Furniss, OTD, OTR/L, BCG

The American Occupational Therapy Association appreciates the opportunity to comment on Measure 0138. This measure has fueled improvement in care quality and processes achieving a rate of just 0.88 in 2017. The measure has seemingly prevented unneeded care and improved outcomes for many people who receive care.

As the incidence of CAUTIs get smaller, the potential for unintended consequences for small populations increases because facilities and organizations work to decrease already small numbers to achieve pay for performance targets. Therefore, AOTA encourages the committee to undertake a comprehensive discussion on potential unintended consequences of the measure as specified.

Maintaining an indwelling catheter can mean maintaining functional independence and control of one's life for some with a spinal cord injury. Being able to independently transfer in any given public restroom, complete toileting and hygiene, and manage clothing is out of reach for some. However, with the right adaptations, someone who is unable to independently toilet is often still able to engage in community mobility (drive or public transit), participate in work, and socialize. With an indwelling catheter, this person is able to participate in life. However, without an indwelling catheter, this person is dependent on a personal care aide, a friend, or even a colleague to participate in these daily activities. This reliance on others for such a personal task can mean the difference between full engagement and avoiding any extended time outside of their home at all costs.

In an effort to provide the best care possible, organizations without specialty spinal cord experience, may remove indwelling catheters to prevent potential CAUTIS. This well-meaning action may mean that after completing a hospital stay and recovering from the acute condition, this person is again home bound until they are able to get back to a specialist. In the worst cases, complications related to neurogenic bladder may arise. AOTA believes that it is important to understand and have a meaningful discussion around the potential for unintended consequences. We appreciate the meaningful gains and improved quality of care that have resulted from Measure 0138. But as the measure performance approaches a rate of 0, the potential for unintended consequences in small populations should be considered thoroughly.

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## Submitted by Camilo Castillo

CAUTI issues in spinal cord injury (SCI) patients

SCI may result in severe impairment of motor, sensory, and autonomous functions. SCI does not affect only the bladder but also limits activities due to immobility and difficulty in self-care. Appropriate treatment for neurogenic bladder helps to protect the integrity of the upper urinary tract and the renal function. However, and due to participation restrictions influenced by environmental factors, e.g. accessibility and availability of adaptive equipment and support, bladder management for an individual with SCI must not be chosen based on one data alone without considering biopsychosocial factors that need be considered in every decision. Because dedicated SCI care achieves better outcomes than general, nonspecialized care, before removing a Foley catheter in a patient with SCI an integrative and comprehensive care involving multidisciplinary teams under the supervision of a physiatrist should be established. To illustrate this better, a patient with high cervical level of injury may need assistant with internment catheterization and they may not be suitable for returning to work, thus another type of bladder management may be selected. In conclusion, bladder management in SCI should be tailored to the patient's level of function and severity and not only based on generalizations and guidelines that may not be applicable to this population. thank you!

## 3498e: Hospital Harm - Pressure Injury

#### Janet Cuddigan, National Pressure Ulcer Advisory Panel; Submitted by Ana Mattson

The Public Policy Committee and the Board of Directors of the National Pressure Ulcer Advisory Panel (NPUAP), are reaching out to you in response to the open comment period for Measures #3498e titled "Hospital Harm Pressure Injury".

The NPUAP is an independent, not-for-profit professional organization dedicated to the prevention and management of pressure injuries. Formed in 1987, the NPUAP Board of Directors is composed of leading experts from diverse health care disciplines—all of whom share a commitment to the prevention and management of pressure injuries. The NPUAP serves as a resource to health care professionals, government, the public, and health care agencies. The NPUAP welcomes and encourages the participation of those interested in pressure injury issues through the utilization of NPUAP educational materials, participation at national conferences, and support of efforts in public policy, education and research.

The NPUAP suggests that further clarification, research and/or edits for this measure would be beneficial pertaining to the following points:

• Proposed 24-hour time frame from admission to declare a hospital acquired pressure injury is not consistent with current science. •As the science surrounding the evolution of a Deep Tissue Pressure Injury (DTPI) continues to advance, it has been postulated that the appearance of a DTPI can take up to

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48 hours or longer to manifest and become visible to the clinician. Therefore, a 24-hour timeframe to declare a pressure injury (specifically a deep tissue pressure injury) as hospital acquired may erroneously penalize institutions for pressure injuries that may have developed prior to admission, but are not visible to clinicians within 24 hours of admission.

•Moreover, current and emerging technologies such as the use of infrared thermographic devices, ultrasound and subepidermal moisture devices support that changes in tissues may be developing below the skin surface, and before visible signs are present to the clinician. Thus, there are some pressure injuries that may actually be present on admission, however not visible within the first 24 hours.

•Similarly, in darker pigmented skin, it may be difficult to visualize a potential deep tissue injury or Stage 1 pressure injury in its early stages, which can also contribute to the erroneous labelling of a hospital acquired pressure injury in these individuals, as skin changes may not be readily detected within the first 24 hours of the hospital admission.

•Based on these clinical concerns, the NPUAP strongly believes that reconsideration for this 24 hour timeframe should be undertaken. A suggestion might be to have an algorithm that states Stage 2, 3, 4 & unstageable pressure injuries should be documented within 24 hours of admission. In the case of a DTPI, a 48-hour time frame or longer could be proposed in which the clinician would document the presence of a DTPI.

• The proposed e-measure lacks clear guidance as to where in the EMR the pressure injury documentation will be extracted. It is unclear from the proposed measure where the information on pressure injury development to support the label of a hospital acquired pressure injury would be obtained within the EMR. In many EMR systems, there are multiple places to document a similar finding, leading to confusion and inconsistencies. This concern was supported by comments from the Meditech users in your beta site testing, who stated "documented in the wound field, making it impossible to distinguish a pressure injury from another type of wound."

 Furthermore, it is unclear if this information will be extracted from a nursing flowsheet, admission assessment or from the provider/midlevel practitioner in free texted notes. Caution has been recommended when interpreting data from an operational EMR, as data inaccuracy, incompleteness or missing data are all consequences of the use of an EMR. (Hersh et al., 2013). Varied descriptions of data elements across multiple EMR vendors, variability in documentation style and multiple locations within the EMR in which to document clinical events such as pressure injuries all contribute to ambiguity in data interpretation.

•The proposed measure lacks clear direction as to the location in the EMR the stage of pressure injury will be pulled. Accurate staging of pressure injuries has been a concern for decades and this concern crosses all disciplines. Studies evaluating clinician knowledge of pressure injury staging using a standardized tool have found that nurses consistently score in the "C" to "C+" range with similar results for physicians. While some facilities allow RNs to stage pressure injuries, others do not. Lack of the availability of a wound care clinician to corroborate or assign a pressure injury stage can lead to erroneous staging, thus inaccurate documentation. Institutions that lack wound care clinicians will be placed at a clear disadvantage as a result of this proposed measure. These concerns are corroborated with your beta test sites as it was noted that there was difficulty determining pressure injury stage from the documentation and concerns were raised regarding the accuracy of the pressure injury staging, especially in hospitals that did not have the availability of a wound care clinician to determine the stage the pressure injury.

• The NPUAP has concerns related to the validity and reliability of the proposed measure based on the scorecard results provided and previous experiences in developing pressure injury e-measures (Warren & Dunton, 2014). •Overall, according to the summary scorecard, data accuracy for pressure injury date

and time was identified as 0% and pressure injury stage was identified at 33%. The reliability and validity of the information extracted for this proposed measure is therefore a concern. It is clear that there remains much work to be done across the United States with respect to the accuracy of pressure injury staging and documentation before an e-measure such as the one proposed can be initiated.

•At the NPUAP, one of our primary goals is to provide pressure injury education to all disciplines, across all types of health care settings and perhaps this issue warrants more attention on a national level for which the NPUAP could be a lead partner.

The NPUAP would be happy to continue our ongoing collaboration with the NQF and CMS to support the educational needs associated with the full understanding of these terms and measures necessary for accurate clinical classification/staging. Thank you for the opportunity to comment.

Sincerely, Sarah Holden-Mount, PT, CWS Public Policy Chair Janet Cuddigan, PhD, RN, CWCN, FAAN President

## 3498e: Hospital Harm - Pressure Injury

#### Sarah Holden-Mount, National Pressure Ulcer Advisory Panel; Submitted by Ana Mattson

The Public Policy Committee and the Board of Directors of the National Pressure Ulcer Advisory Panel (NPUAP), are reaching out to you in response to the open comment period for Measures #3498e titled "Hospital Harm Pressure Injury".

The NPUAP is an independent, not-for-profit professional organization dedicated to the prevention and management of pressure injuries. Formed in 1987, the NPUAP Board of Directors is composed of leading experts from diverse health care disciplines—all of whom share a commitment to the prevention and management of pressure injuries. The NPUAP serves as a resource to health care professionals, government, the public, and health care agencies. The NPUAP welcomes and encourages the participation of those interested in pressure injury issues through the utilization of NPUAP educational materials, participation at national conferences, and support of efforts in public policy, education and research.

The NPUAP suggests that further clarification, research and/or edits for this measure would be beneficial pertaining to the following points:

• Proposed 24-hour time frame from admission to declare a hospital acquired pressure injury is not consistent with current science. •As the science surrounding the evolution of a Deep Tissue Pressure Injury (DTPI) continues to advance, it has been postulated that the appearance of a DTPI can take up to 48 hours or longer to manifest and become visible to the clinician. Therefore, a 24-hour timeframe to declare a pressure injury (specifically a deep tissue pressure injury) as hospital acquired may erroneously penalize institutions for pressure injuries that may have developed prior to admission, but are not visible to clinicians within 24 hours of admission.

•Moreover, current and emerging technologies such as the use of infrared thermographic devices, ultrasound and subepidermal moisture devices support that changes in tissues may be developing below the skin surface, and before visible signs are present to the clinician. Thus, there are some pressure injuries that may actually be present on admission, however not visible within the first 24 hours. •Similarly, in darker pigmented skin, it may be difficult to visualize a potential deep tissue injury or Stage 1 pressure injury in its early stages, which can also contribute to the erroneous labelling of a hospital acquired pressure injury in these individuals, as skin changes may not be readily detected within the first 24 hours of the hospital admission.

•Based on these clinical concerns, the NPUAP strongly believes that reconsideration for this 24 hour timeframe should be undertaken. A suggestion might be to have an algorithm that states Stage 2, 3, 4 & unstageable pressure injuries should be documented within 24 hours of admission. In the case of a DTPI, a 48-hour time frame or longer could be proposed in which the clinician would document the presence of a DTPI.

• The proposed e-measure lacks clear guidance as to where in the EMR the pressure injury documentation will be extracted. It is unclear from the proposed measure where the information on pressure injury development to support the label of a hospital acquired pressure injury would be obtained within the EMR. In many EMR systems, there are multiple places to document a similar finding, leading to confusion and inconsistencies. This concern was supported by comments from the Meditech users in your beta site testing, who stated "documented in the wound field, making it impossible to distinguish a pressure injury from another type of wound."

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•The proposed measure lacks clear direction as to the location in the EMR the stage of pressure injury will be pulled. Accurate staging of pressure injuries has been a concern for decades and this concern crosses all disciplines. Studies evaluating clinician knowledge of pressure injury staging using a standardized tool have found that nurses consistently score in the "C" to "C+" range with similar results for physicians. While some facilities allow RNs to stage pressure injuries, others do not. Lack of the availability of a wound care clinician to corroborate or assign a pressure injury stage can lead to erroneous staging, thus inaccurate documentation. Institutions that lack wound care clinicians will be placed at a clear disadvantage as a result of this proposed measure. These concerns are corroborated with your beta test sites as it was noted that there was difficulty determining pressure injury stage from the documentation and concerns were raised regarding the accuracy of the pressure injury staging, especially in hospitals that did not have the availability of a wound care clinician to determine the stage the pressure injury.

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## 3498e: Hospital Harm - Pressure Injury

#### Submitted by Dr. Kevin T. Kavanagh, MD, MS

Importance: According to AHRQ Partnership For Patients' Program, pressure injuries are the second most common adverse event behind drug events. Thus, having a usable metric for this patient safety event is imperative. It needs to be stressed this is an important "replacement metric" closing an important patient safety measurement "gap," since the impact of the current PSI-90 pressure injury metric (PSI 03) has been mitigated due to concerns regarding its use of administrative data and its validity.

Pressure Injury should be viewed as 100% preventable and aggressive preventative strategies should be implemented in all at-risk patients, not just those showing signs of impending ulcers. These include, mattress cushions, turning the patient every 2 hours and preemptively padding areas which are prone to form ulcers. Thus, whether or not a Stage I injury is present, prompt preventative strategies on all at-risk patients should prevent progression in the vast majority of patients.

Advantages of the Replacement Metric: One of the major advantages of the proposed metric is that it utilizes EMR and not Administrative Billing Data. The latter has long been held by the industry as having a low validity. In addition, the definition of the metric has been changed. It now measures injury with any skin breakdown (Stage II, III, and IV pressure injuries), avoiding a subjective judgement on the depth of the ulcer. Thus, when drainage is observed or when there is lack of skin integrity an event will be captured. (Note: Stage I injury is a discoloration of skin without skin breakdown).

The current PSI 03 metric only reports Stage III and IV pressure injuries, which when entering data into the EMR requires a subjective judgement on depth in the differentiation of Stage II and Stage III. Such a judgement would be expected to require additional training and the metric would be expected to have decreased validity and reliability. In addition, it does not measure all pressure ulcers, since Stage 2 ulcers are not captured.

Burden: There should be little burden on the facility, since the EMR systems can be used to captures the events. Thus, the burden should be similar to that of the original PSI 03 metric.

Disparities: Disparities is an important issue. In pressure injuries, healthcare resources and socioeconomic factors are of paramount importance and should not be mathematically negated but instead corrected. Stage II, III and IV pressure ulcers which are present on or develop within 24 hours of admission are captured. The 24-hour grace period will allow for identification of latent pressure injury. This should correct for preadmission ulcer formation caused by access and socioeconomic disparities. In a study of nursing home residents, Park Lee, et al, in a NCHS Data Brief reviewed over 159,000 nursing home residents and found that "Pressure ulcer prevalence varied by age, sex, and length of time since admission to the nursing home, but not by race." <u>https://www.cdc.gov/nchs/data/databriefs/db14.pdf</u>

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