NATIONAL QUALITY FORUM

Memo

August 13, 2019

To: NQF members

From: NQF staff

Re: Surgery, spring 2019 cycle draft report for review

Background

This report reflects the review of measures in the Surgery project. The Standing Committee evaluated five maintenance measures and two new measures. The measures were reviewed against NQF's standard evaluation criteria, and the Standing Committee recommended all seven measures for endorsement.

Recommended Measures:

- 0456 Participation in a Systematic National Database for General Thoracic Surgery (The Society of Thoracic Surgeons)
- 2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery (The Society of Thoracic Surgeons)
- 0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories (The Society of Thoracic Surgeons)
- 0733 Operative Mortality Stratified by the 5 STAT Mortality Categories (The Society of Thoracic Surgeons)
- 0734 Participation in a National Database for Pediatric and Congenital Heart Surgery (The Society of Thoracic Surgeons)
- 3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups (Centers for Medicare & Medicaid Services/YaleCORE)
- 3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery (Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (Centers for Medicare & Medicaid Services/YaleCORE)

NQF Member and Public Commenting

NQF members and the public are encouraged to provide comments via the online commenting tool on the draft report as a whole, or on the specific measures evaluated by the Surgery Standing Committee.

Please note that commenting concludes on September 11, 2019 at 6:00 pm ET—no exceptions.

Surgery Spring 2019 Cycle: CDP Report

DRAFT REPORT FOR COMMENT

August 13, 2019

NATIONAL QUALITY FORUM

This report is funded by the Department of Health and Human Services under contract HHSM-500-2017-00060I Task Order HHSM-500-T0001.

Contents

Surgery, Spring 2019 Cycle

DRAFT REPORT FOR COMMENT

Executive Summary

Quality measurement in surgery is essential to improve outcomes for the millions of individuals undergoing surgery and surgical procedures each year. To date, the National Quality Forum (NQF) has endorsed more than 60 measures that address surgical care including perioperative safety, general surgery and a range of specialties like cardiac, cardiothoracic, colorectal, ocular, orthopedic, urogynecologic, and vascular surgery.

During its spring 2019 review cycle, NQF's Surgery Standing Committee evaluated two newly submitted measures, and five measures undergoing maintenance review against NQF's standard evaluation criteria. The Committee recommended all seven measures for endorsement. The recommended measures are:

- 0456 Participation in a Systematic National Database for General Thoracic Surgery
- 2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery
- 0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories
- 0733 Operative Mortality Stratified by the 5 STAT Mortality Categories
- 0734 Participation in a National Database for Pediatric and Congenital Heart Surgery
- 3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups
- 3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Brief summaries of the measures currently under review 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 Appendix A.

Introduction

Given the increasing rates and costs associated with inpatient and outpatient surgeries in the United States, performance measurement and reporting provide an opportunity to improve the safety and quality of care received by Americans undergoing surgery and surgical procedures. In 2010, 28.6 million ambulatory surgery visits to hospitals and ambulatory surgical centers occurred, representing 48.3 million surgical and nonsurgical procedures.[1] In 2014, there were 17.2 million hospital visits that included at least one surgery.[2] Of these surgeries, over half occurred in a hospital-owned ambulatory surgical center.[2]

Ambulatory surgeries have increased over time as a result of less invasive surgical techniques, patient conveniences, such as less time spent undergoing a procedure, and lower costs.[3,4] By payer, private insurance accounted for 48.6 percent of ambulatory surgery visits, with Medicare and Medicaid covering 30.8 percent and 14.0 percent of visits, respectively.[2] However, there are risks associated with ambulatory surgeries including increased pain and longer time than anticipated to return to daily activities, and unplanned subsequent hospital visits following surgery.[5,6]

With the continued growth in the outpatient surgery market, monitoring and assessing the quality of the services provided holds great importance.

NQF Portfolio of Performance Measures for Surgery Conditions

The Surgery Standing Committee (Appendix C) oversees NQF's portfolio of Surgery measures (Appendix B), which includes measures for perioperative safety, general surgery and a range of specialties like cardiac, cardiothoracic, colorectal, ocular, orthopedic, urogynecologic, and vascular surgery. This portfolio contains 65 measures: 12 process measures, 42 outcome and resource use measures, four structural measures, and seven composite measures (see table below).

Table 1. NQF Surgery Portfolio of Measures

	Process	Outcome/Resource Use	Structure	Composite
Abdominal and Colorectal Surgery	1	1	–	–
Anesthesia	–	1	–	–
Cardiac Surgery	5	16	3	7
General Surgery	–	3	–	–
Cross-cutting (Inpatient & Outpatient Surgery)	–	2	–	–
Cross-Cutting (Inpatient Surgery)	–	2	–	–
Cross-Cutting (Outpatient Surgery)	–	2	–	–
Orthopedic Surgery	–	3	–	–
Ophthalmology	–	5	–	–
Thoracic Surgery	–	1	1	–

	Process	Outcome/Resource Use	Structure	Composite
Urogynecology/Gynecology	4	–	–	–
Vascular Surgery	2	6	–	–
Total	12	42	4	7

Additional measures related to surgery have been assigned to other portfolios. These include healthcare-associated infection measures (Patient Safety), care coordination measures (Geriatrics and Palliative Care), patient experience measures (Patient Experience and Function), imaging efficiency measures (Cost and Resource Use), and a variety of condition- or procedure-specific outcome measures (Cardiovascular, Cancer, Renal, etc.).

Surgery Measure Evaluation

On July 2, July 10, and July 15, 2019 the Surgery Standing Committee evaluated two new measures and five measures undergoing maintenance review against NQF's standard measure evaluation criteria.

Table 2. Surgery Measure Evaluation Summary

	Maintenance	New	Total
Measures under consideration	5	2	7
Measures recommended for endorsement	5	2	7

Comments Received Prior to Committee Evaluation

NQF solicits comments on endorsed measures on an ongoing basis through the Quality Positioning System (QPS). 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 May 8, 2019 and will close on September 9, 2019. As of July 2, three comments were submitted and shared with the Committee prior to the measure evaluation meetings (Appendix F).

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.

Scientific Acceptability Criterion – Levels of Analysis

Two measures submitted for maintenance evaluation, 0733 *Operative Mortality Stratified by the 5 STAT Mortality Categories* and 2683 *Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery***,** are specified for clinician groups and hospital/facilities; therefore, two sets of testing are expected. Hospital/facilities participating in the Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD) are the measured entities included in the testing and analysis provided by the

developer; however, it was not clear if the testing and analysis also included clinician groups. The developer clarified that the measure is specified at the hospital/facility level.

Structure Measures – Importance to Measure Report and Scientific Acceptability

The Committee initially had concerns about whether three structure measures submitted for maintenance evaluation by the STS met NQF's current measure evaluation criteria for evidence, performance gap, reliability, and validity: 0456 *Participation in a Systematic National Database for General Thoracic Surgery*; 0732 *Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories;* and 0734 *Participation in a National Database for Pediatric and Congenital Heart Surgery*.

The Committee had a lengthy discussion about the relationship between participating in a registry, surgical volumes, and the empirical evidence required to support improved patient outcomes. Prior to voting, the developer provided the Committee additional articles to review that discussed a positive association between registry participation and improved outcomes and audit reports of the data in the STS databases. The Committee recommended the measures for continued endorsement.

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 Appendix A.

0456 Participation in a Systematic National Database for General Thoracic Surgery (The Society of Thoracic Surgeons): Recommended

Description: Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures; **Measure Type**: Structure; **Level of Analysis**: Clinician : Group/Practice; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

The measure developer provided additional information for Committee members to review prior to voting on the three STS structure measures under consideration (0456, 0732, and 0734). The Committee reviewed articles that discussed a positive association between registry participation and improvement in outcomes and audit reports showing the completeness of the data in STS databases. The Committee agreed that this measure continues to add value to the Surgery portfolio and recommended the measure for continued endorsement.

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery (The Society of Thoracic Surgeons): Recommended

Description: Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure; **Measure**

Type: Outcome; **Level of Analysis**: Clinician : Group/Practice; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

This outcome measure was last endorsed in 2015. Operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk by improving the structure and processes of pediatric and congenital cardiac surgery, including preoperative and postoperative care as well as intraoperative techniques. The Committee accepted that the evidence had not changed since its previous evaluation of this measure and believed there was enough of a gap to meet this criterion. The Standing Committee requested clarification regarding the level of analysis, and the developer clarified that the measure was submitted at the hospital level. The Committee generally agreed that the reliability and validity testing results met NQF criteria. The data are routinely collected, and the measure is feasible. Overall, the Committee agreed that the measure met NQF evaluation criteria and recommended it for endorsement.

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories (The Society of Thoracic Surgeons): Recommended

Description: Surgical volume for pediatric and congenital heart surgery: total programmatic volume and programmatic volume stratified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool; **Measure Type**: Structure; **Level of Analysis**: Clinician : Group/Practice; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

The measure developer provided additional information for Committee members to review prior to voting on the three STS structure measures under consideration (0456, 0732, and 0734). The Committee reviewed articles that discussed public reporting of programmatic volume data and the association of volume with improved outcomes. The Committee agreed that this measure continues to add value to the Surgery portfolio and recommended the measure for continued endorsement.

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories (The Society of Thoracic Surgeons): Recommended

Description: Percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Categories, a multi-institutional validated risk stratification tool; **Measure Type**: Outcome; **Level of Analysis**: Clinician : Group/Practice; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

This outcome measure was last endorsed in 2015. Operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk. Over the past decade, mortality after pediatric cardiac surgery has been declining. Reporting outcomes stratified into different categories of risk can help avoid risk aversive behavior. The Committee accepted that the evidence had not changed since its previous

evaluation for this measure and believed there was enough of a gap to meet this criterion. The Standing Committee requested clarification regarding the level of analysis, and the developer clarified that the measure was submitted at the hospital level. The Committee generally agreed that the reliability and validity testing results met NQF criteria. The data are routinely collected, and the measure is feasible. Overall, the Committee agreed that the measure met NQF evaluation criteria and recommended it for endorsement.

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery (The Society of Thoracic Surgeons): Recommended

Description: Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.; **Measure Type**: Structure; **Level of Analysis**: Clinician : Group/Practice, Other; **Setting of Care**: Inpatient/Hospital; **Data Source**: Registry Data

The measure developer provided additional information for Committee members to review prior to voting on the three STS structure measures under consideration (0456, 0732, and 0734). The Committee reviewed articles that discussed public reporting of programmatic volume data and the association of volume with improved outcomes. The Committee agreed that this measure continues to add value to the Surgery portfolio and recommended the measure for continued endorsement.

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups (Centers for Medicare & Medicaid Services [CMS]): Recommended

Description: This measure is a re-specified version of the measure, "Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)" (NQF 1550), which was developed for patients 65 years and older using Medicare claims data. This re-specified measure attributes outcomes to MIPS participating Eligible Clinicians and/or Eligible Clinician Groups ("providers"), rather than to hospitals, and assesses each provider's complication rate, 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). **Measure Type**: Outcome; **Level of Analysis**: Clinician : Group/Practice, Clinician : Individual; **Setting of Care**: Inpatient/Hospital, Outpatient Services; **Data Source**: Claims, Enrollment Data

This outcome measure is specified and tested at both the individual clinician level and the group/practice level, and the Committee voted separately by level of analysis. The Committee agreed that communication between clinicians, prevention of and response to complications, patient safety, and coordinated care lead to improved patient outcomes by decreasing the risk of complications following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA). The Committee agreed that there is a gap in care at both levels of analysis. The Scientific Methods Panel and the Committee agreed that the measure is both reliable and valid as specified. The Committee did not convey any concerns regarding feasibility, use, and usability of the measure. However, one Committee

member suggested that CMS consider including all payers and/or patients younger than 65 years old in the measure specifications.

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery (Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation [YNHHSC/CORE]): Recommended

Description: This measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 90 days of the procedure date of an index CABG admission. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. This measure may be used in one or more to be defined 90-day payment models. **Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Claims

This outcome measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated coronary artery bypass graft (CABG) procedure. The Committee agreed that reducing healthcare costs while incentivizing multidisciplinary care, improving communication among providers involved in care transition, and encouraging strategies that promote disease management lead to improved patient health and decreased risk of mortality following CABG surgery. The Committee discussed the performance and disparities data that were evaluated by population subgroups using the dual eligible method and the AHRQ SES Index Scores. They concluded that there is an opportunity for improvement that warrants a national performance measure. The Committee agreed with the Scientific Methods Panel that the reliability and validity testing met NQF criteria. The data are routinely collected, and the measure is feasible. The Committee did not express any other concerns about the feasibility, use, and usability of the measure, and recommended the measure for NQF endorsement.

References

1 Hall MJ, Schwartzman A, Zhang J, et al. *Ambulatory Surgery Data From Hospitals and Ambulatory Surgery Centers: United States, 2010*. Hyattsville, MD: Centers for Disease Control and Prevention; 2017. https://www.cdc.gov/nchs/data/nhsr/nhsr102.pdf.

2 Steiner CA, Karaca Z, Moore BJ, et al. Surgeries in Hospital-Based Ambulatory Surgery and Hospital Inpatient Settings, 2014: Statistical Brief #223. In: *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs*. Rockville, MD: Agency for Healthcare Research and Quality; 2006. http://www.ncbi.nlm.nih.gov/books/NBK442035/. Last accessed February 2018.

3 Munnich EL, Parente ST. Procedures take less time at ambulatory surgery centers, keeping costs down and ability to meet demand up. *Health Aff*. 2014;33(5):764-769.

4 Farrell D, Jensen E, Kochner B, et al. *Accounting for the Cost of US Health Care: A New Look at Why Americans Spend More*. McKinsey Global Institute; 2008. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/accounting-for-the-cost-of-us-health-care. Last accessed February 2018.

5 Manohar A, Cheung K, Wu CL, et al. Burden incurred by patients and their caregivers after outpatient surgery: a prospective observational study. *Clin Orthop*. 2014;472(5):1416-1426.

6 Fox JP, Vashi AA, Ross JS, et al. Hospital-based, acute care after ambulatory surgery center discharge. *Surgery*. 2014;155(5):743-753.

Appendix A: Details of Measure Evaluation

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

Measures Recommended

0456 Participation in a Systematic National Database for General Thoracic Surgery

Submission | Specifications

Description: Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.

Numerator Statement: Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures

Denominator Statement: N/A

Exclusions: N/A

Adjustment/Stratification: N/A

Level of Analysis: Clinician : Group/Practice

Setting of Care: Inpatient/Hospital

Type of Measure: Structure

Data Source: Registry Data

Measure Steward: The Society of Thoracic Surgeons

STANDING COMMITTEE MEETING 07/15/2019

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

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

1a. Evidence: **H-0**; **M-10**; **L-3**; **I-1**; 1b. Performance Gap: **H-5; M-7; L-1; I-1**

Rationale:

- For the 2014 endorsement evaluation, some committee members questioned the linkage between database participation and improved quality. The developer noted that the evidence base for the measure is inferred from published accounts of improved quality following participation in the STS Adult Cardiac Surgery and other national databases.
- For the current evaluation, the Committee discussed whether evidence inferred from published accounts of improved quality following participation in the STS General Thoracic Surgery Database (GTSD) and other national databases is enough to support measuring physician participation in a registry leads to a desired health outcome. The developer did not provide empirical evidence demonstrating that providers that do not participate in a registry have worse outcomes than those providers that do participate in a registry – as asked by the Committee.
- The developer provided the number of participants in the STS GTSD from 2014 – 2019 (2014: 244 participants; mid-2018: 286 participants; and beginning of 2019: 298 participants). Some Committee members expressed concern that it is unclear if counting the

number of participants demonstrates considerable variation or represents overall less-than-optimal performance in quality of care across providers.

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

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

2a. Reliability: **M-12; L-2; I-0**; 2b. Validity: **M-11; L-3; I-0**

<u>Rationale</u>:

- Measure specifications provided are not complete, precise, or unambiguous; includes numerator statement only. NQF guidance states that measure specifications include the target population (denominator) to whom the measure applies, identification of those from the target population who achieved the specific measure focus (numerator, target condition, event, outcome), measurement time window, exclusions, risk adjustment/stratification, definitions, data source, code lists with descriptors, sampling, scoring/computation.
- The developer presented data element validity testing to demonstrate both reliability and validity. The developer provided agreement rates from a 2013 audit of 17 STS GTSD participants. Data were re-abstracted for 20 cases and 36 individual data elements were compared with those previously submitted to the data warehouse. Percent agreement rates were provided for 26 data elements and overall percent agreement rate.
- Some committee members were concerned that relevant threats to validity were not assessed and that the data elements used for validity testing were not consistent with the measure specifications.

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3. Feasibility: H-1; M-12; L-1; 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 developer reports there are no direct costs to collect the data for this measure. The participation fee for the STS GTSD is on a per surgeon basis. For each surgeon joining that is an STS member, the fee is $550. For each surgeon joining that is not an STS member, the fee is $700.
- The developer reports that data are generated or collected by and used by healthcare personnel during the provision of care or are abstracted from medical records by someone other than the person obtaining the original information; however, members of the Committee noted the measure requires reporting to the registry and is not collected during care delivery. It was also noted that the measure requires substantial institutional commitment to participate and data extraction by chart abstractors is required.

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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-14; No Pass-0** *4b. Usability:* **H-1; M-11; L-1; I-1**

Rationale:

- The developer reported that lobectomy data from the STS GTSD has been publicly reported since 2017 and noted a second public reporting opportunity will be added to the STS GTSD later in 2019 with the introduction of voluntary reporting of esophagectomy data. The developer did not discuss how the anticipated increase in STS GTSD participation due to the new voluntary public reporting opportunity for esophagectomy later in 2019 will further the goal of high-quality, efficient healthcare.
- One Committee member noted that there are no benchmarks to those not participating in the registry. Additionally, a Committee member noted that there are no unintended consequences except utilization of resources that could be applied elsewhere.

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5. Related and Competing Measures

- This measure is related to:
    - 0113: Participation in a Systematic Database for Cardiac Surgery
    - 0493: Participation by a Physician or Other Clinician in Systematic Clinical Database Registry that Includes Consensus Endorsed Quality Measures
    - 0734: Participation in a National Database for Pediatric and Congenital Heart Surgery
    - 0493: Participation by a Physician or Other Clinician in Systematic Clinical Database Registry that Includes Consensus Endorsed Quality Measures (Endorsement Removed)
- The Committee will discuss related and competing measures during the post-comment call on September 23, 2019.

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6. Standing Committee Recommendation for Endorsement: **Y-11**; **N-3**

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7. Public and Member Comment

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8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

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9. Appeals

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Submission | Specifications

Description: Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

Numerator Statement: Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

Denominator Statement: All patients undergoing index pediatric and/or congenital heart surgery

Exclusions: -Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure.

-All operations where the primary procedure is either pectus repair or bronchoscopy are not classified as cardiac operations (i.e., they are thoracic procedures) and thus, they are excluded from the denominator

Adjustment/Stratification: Statistical risk model

Level of Analysis: Clinician : Group/Practice

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

Data Source: Registry Data

Measure Steward: The Society of Thoracic Surgeons

STANDING COMMITTEE MEETING 07/10/2019

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

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

1a. Evidence: **Pass-14; No Pass-0**; 1b. Performance Gap: **H-6; M-8; L-0; I-0**

Rationale:

- For the 2015 endorsement evaluation, the developer noted evaluation of operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk by improving the structure and processes of pediatric and congenital cardiac surgery including preoperative and postoperative care as well as intraoperative techniques. For the current evaluation, the Committee agreed the evidence has not changed and did not repeat the discussion.

- The developer provided Society of Thoracic Surgeons (STS) data on specific observed to expected (O/E) ratios using STS data from January 2010-December 2013 and July 2014-June 2018. The mean score for 105 sites was 1.1 (2014-2018) with ranges from 0.59 to 1.71.
- The developer provided disparities data by race and ethnicity in 2010-December 2013 and July 2014-June 2018. The developer also estimated odds ratios between insurance types.
- The developer provided disparities data by sex and age in July 2011 – June 2014 and July 2014 – June 2017. The estimated odds ratio (OR) was generally higher among black and Native American patients (1.32 and 1.49) The estimated OR was higher among none/self-pay patients (1.52) versus Medicaid patients (1.09).

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

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

2a. Reliability: **H-2; M-12; L-0; I-0**; 2b. Validity: **H-1; M-13; L-0; I-0**

<u>Rationale</u>:

- The Standing Committee requested clarification regarding the level of analysis. Specifications indicated the clinician group/practice level of analysis; however, data used for testing appear to be hospital-level data. The developer clarified that the measure was submitted at the hospital level of analysis.
- Reliability of the measure was assessed with data from the STS Congenital Heart Surgery Database at the measure score level using a hierarchical model. The sample for the analysis included 52,224 records for operations performed from 2010 – 2013. The developer calculated the reliability for 200, 500, and 800 patients and the average reliability across the sample. The average parameter value was estimated at 0.69.
- Empirical validity testing of patient-level data was presented to demonstrate validity. The developer provided agreement rates from a 2014 audit of 11 STS Congenital Heart Surgery Database participants. The developer assessed percent agreement rates for 27 data elements related to demographics, hospitalization, diagnoses, procedures, operative, and discharge/readmission. The percent agreement for the data elements general mortality – hospital, general mortality – database, and general mortality 30-day status were 100.0, 99.09, and 99.55, respectively.

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3. Feasibility: H-4; M-10; 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)

<u>Rationale</u>:

- EHR capability may differ among institutions; therefore, availability of data elements in electronically defined fields may vary. However, the developer reported that all data elements from participating institutions are submitted to the STS Congenital Heart Surgery Database in electronic format following a standard set of data specifications. The majority of participating institutions obtain data entry software products that are certified for the purposes of collecting STS Congenital Heart Surgery Database data elements.
- The developer reports that although there are no direct costs to collect data for this measure, STS Congenital Heart Surgery Database participants pay $4,000 per year if a majority of participating physicians at an institution or practice are STS members and $5,000

per year if a majority of participating physicians at an institution or practice are not STS members. In addition, there is a volume-based fee of $3.00 per patient record submitted as part of any data harvest to the data warehouse.
- Committee members noted that the only concern was the burden and cost associated with abstraction of the data and cost to participate in the registry.

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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-14; No Pass-0**; *4b. Usability:* **H-2; M-12; L-0; I-0**

Rationale:

- According to the developer, data from the STS Congenital Heart Surgery has been publicly reported since January 2015. The STS also convenes a Public Reporting Task Force to review feedback on STS public reporting, to promote greater participation among STS members, and to review and enhance the usability of the format of public reporting on the STS website.
- The developer examined aggregated outcomes of all hospitals combined within four 12-month time intervals within the years 2014-2018. The observed mortality rate decreased from 3.01% in Year 1 to 2.55% in Year 4 whereas the expected mortality rate increased from 2.71% in Year 1 to 2.86% in Year 4.
- The developer hypothesized that the increase in mortality rate over time suggests that the improvement in observed mortality over time was not explained by a lower-risk case mix. The aggregate O/E ratio decreased from 1.11 (95% CI 1.03 to 1.19) in Year 1 to 0.89 (95% CI 0.82 to 0.96) in Year 4. The non-overlapping confidence intervals indicates that the difference was unlikely to be explained by chance variation.

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5. Related and Competing Measures

- This measure competes with:
    - 0339: RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
- During the post comment call on September 23, 2019, the Committee may address issues around harmonization and/or selection of best measures, if appropriate.

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6. Standing Committee Recommendation for Endorsement: **Y-14**; **N-0**

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7. Public and Member Comment

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8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

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9. Appeals

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Submission | Specifications

Description: Surgical volume for pediatric and congenital heart surgery: total programmatic volume and programmatic volume stratified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

Numerator Statement: 1) Total number of pediatric and congenital cardiac surgery operations and 2) number of pediatric and congenital cardiac surgery operations in each of the strata of complexity specified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

Denominator Statement: N/A

Exclusions: N/A

Adjustment/Stratification: Stratification by risk category/subgroup

Level of Analysis: Clinician : Group/Practice

Setting of Care: Inpatient/Hospital

Type of Measure: Structure

Data Source: Registry Data

Measure Steward: The Society of Thoracic Surgeons

STANDING COMMITTEE MEETING 07/10/2019

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

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

1a. Evidence: **H-2; M-11; L-0; I-1**; 1b. Performance Gap: **H-3; M-10; L-0; I-1**

Rationale:

- For the 2015 endorsement evaluation, the developer stated this structure measure is necessary to calculate outcome measures that use this structure measure as a denominator. The evidence submitted by the developer included a list of references; no evidence of systematic review of expert opinion that the benefits of what is being measured outweighs potential harms was included.
- The developer provided distribution of participant-specific volumes overall and stratified by the STAT Mortality Categories and distribution of participant-specific data by sex, race, and age group.
- The Committee discussed similar issues related to evidence and performance gap related to measure 0456. The Committee's discussion included whether the evidence and performance data provided were sufficient and met NQF criteria. A member of the Committee also questioned how a performance threshold is set, if it is a moving target and if this measure drives unnecessary surgeries.

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

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

2a. Reliability: **M-13; L-0; I-1**; 2b. Validity: **M-12; L-1; I-1**

<u>Rationale</u>:

- The measure specifications as submitted by the developer were incomplete and included a numerator statement only. Denominator, measurement time window, definitions, and other details needed to consistently implement the measure were not provided. Some Committee members disagreed the specifications are unambiguous and noted providers either participate or they do not.
- A member of the Committee provided a pre-evaluation comment related to validity stating that too little data were provided linking volume to outcomes for very specific procedures. Another pre-evaluation comment noted that the categorical grouping may not be an adequate answer to a very heterogenous group of surgeries.

3. Feasibility: H-3; M-11; 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)

<u>Rationale</u>:

- According to the developer, data elements in this measure have been standard in STS Congenital Heart Surgery Database for 8 to 15 years; however, committee members noted measure specification details (data elements) were not provided.
- The developer reports that there are no direct costs to collect the data for this measure. The participation fee for the STS Congenital Heart Surgery Database (CHSD) is $4,000 per year if most participating physicians at an institution or practice are STS members and $5,000 per year if a majority of participating physicians at an institution or practice are not STS members. In addition, there is a "volume-based" fee of $3.00 per patient record submitted as part of any data harvest to the data warehouse.
- The Committee noted that the measure requires substantial institutional commitment to participate and data extraction by chart abstractors is required.

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-13; No Pass-1** *4b. Usability:* **H-2; M-11; L-0; I-1**

<u>Rationale</u>:

- The developer reported that data from the CHSD has been publicly reported since January 2015, it is not clear if and/how the performance results from this measure are used and publicly reported.
- The developer provided the number of participants and operations by volume groups are defined with overall volume; however, did not discuss how these data demonstrate progress towards achieving high-quality, efficient healthcare.

- Some Committee members recommended publicly reporting procedure volumes with related outcome measures, yet others noted it may drive overuse of surgery and lead to a monopoly concentration of procedures to the detriment of community capabilities. Another Committee member commented that while they appreciate the effort, they were not sure this should be a quality measure; rather, the registry should report case volumes for all participants.

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5. Related and Competing Measures

- This measure is related to:
    - 0339: RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
- The Committee will discuss related and competing measures during the post-comment call on September 23, 2019.

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6. Standing Committee Recommendation for Endorsement: **Y-12**; **N-2**

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7. Public and Member Comment

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8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

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9. Appeals

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Submission | Specifications

Description: Percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Categories, a multi-institutional validated risk stratification tool

Numerator Statement: Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Levels, a multi-institutional validated complexity stratification tool

Denominator Statement: All patients undergoing index pediatric and/or congenital heart surgery

Exclusions: N/A

Adjustment/Stratification: Stratification by risk category/subgroup

Level of Analysis: Clinician : Group/Practice

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

Data Source: Registry Data

Measure Steward: The Society of Thoracic Surgeons

STANDING COMMITTEE MEETING 07/10/2019

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

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

1a. Evidence: **Pass-14; No Pass-0**; 1b. Performance Gap: **H-2; M-12; L-0; I-0**

Rationale:

- For the 2015 endorsement evaluation, the developer noted evaluation of operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk. Over the past decade, mortality after pediatric cardiac surgery has been declining and currently stands at 2.9%. By reporting outcomes stratified into different categories of risk, one can avoid risk aversive behavior. For the current evaluation, the Committee agreed the evidence has not changed and did not repeat the discussion.
- The developer provided Society of Thoracic Surgeons (STS) data on participant-specific observed rates for the four-year period from July 2014 – June 2018 and for each 12-month period during the four years, i.e., July 2014 – June 2015; July 2015 – June 2016; July 2016 – June 2017; and July 2017 - June 2018. The distribution of observed rates (proportion) stratified by STAT Mortality categories for the four-year period demonstrated mortality rates became progressively higher as procedure categories became more complex. Mean rates across each of the 12-month periods also showed progressively higher mortality rates as procedure categories became more complex.

- The developer provided the distribution of participant-specific operative mortality rates stratified by STAT Mortality Categories for the period July 2014 – June 2018. The disparities data were provided for sex, race (black, white, other), and defined age groups (neonate, infant, children, adults).

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

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

2a. Reliability: **H-1; M-13; L-0; I-0**; 2b. Validity: **H-1; M-13; L-0; I-0**

<u>Rationale</u>:

- The Standing Committee requested clarification regarding the level of analysis. Specifications indicated the clinician group/practice level of analysis; however, data used for testing appear to be hospital-level data. The developer clarified that the measure was submitted at the hospital level.
- Empirical validity testing of patient-level data were presented to demonstrate both reliability and validity. The developer provided agreement rates from a 2014 audit of 11 STS Congenital Heart Surgery Database participants. Agreement rates ranged from 54.55 to 100.0 with overall data completeness agreement rate of 97.68% and overall data accuracy agreement rate of 97.45%. Critical data elements and agreement rates relevant to risk-adjusted surgical re-exploration were also included.
- The empirical validity testing was conducted using predictive validity to determine if the measure at one point in time accurately predicts performance at a later point in time. The developer suggest that stability of measure scores over time may indicate that the measure is capturing an accurate indication of provider performance. There is some disagreement about whether stability in performance demonstrates predictive validity; some would argue that changes in performance over time are to be expected—and are, in fact, desirable—as the result of quality improvement interventions.

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3. Feasibility: H-4; M-10; 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)

<u>Rationale</u>:

- EHR capability may differ among institutions; therefore, availability of data elements in electronically defined fields may vary. However, the developer reported that all data elements from participating institutions are submitted to the STS Congenital Heart Surgery Database in electronic format following a standard set of data specifications. Most participating institutions obtain data entry software products that are certified for the purposes of collecting STS Congenital Heart Surgery Database data elements.
- The developer reports that although there are no direct costs to collect data for this measure, STS Congenital Heart Surgery Database participants pay $4,000 per year if most participating physicians at an institution or practice are STS members and $5,000 per year if a majority of participating physicians at an institution or practice are not STS members. In addition, there is a volume-based fee of $3.00 per patient record submitted as part of any data harvest to the data warehouse.

- Committee members noted that the only concern was the burden and cost associate with abstraction of the data and cost to participate in the registry.

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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-14; No Pass-0**; *4b. Usability:* **H-3; M-11; L-0; I-0**

Rationale:

- According to the developer, data from the STS Congenital Heart Surgery has been publicly reported since January 2015. The STS also convenes a Public Reporting Task Force to review feedback on STS public reporting, to promote greater participation among STS members, and to review and enhance the usability of the format of public reporting on the STS website
- The developer provided data for the number of participants and operations by performance groups (mid- and low-performance) for the time period of July 2014 to June 2016, and from July 2016 to June 2018.
- It was noted that the performance designation is reassigned each time the measure is calculated and reported. The performance is compared to the average STS performance to that time period.
- Data also showed the overall rates in the last four 12-month periods, and data based on Geographic area and number and percentage of accountable entities and patients included for the time period of July 2014 to June 2016, and from July 2016 to June 2018.

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5. Related and Competing Measures

- This measure directly competes with NQF #0339: RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06). Measure 0339 is based on administrative data while the STS measure is based on clinical registry data.
- During the post comment call on September 23, 2019, the Committee may address issues around harmonization and/or selection of best measures, if appropriate.

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6. Standing Committee Recommendation for Endorsement: **Y-14**; **N-0**

Rationale

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7. Public and Member Comment

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8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

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9. Appeals

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Submission | Specifications

Description: Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.

Numerator Statement: Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.

Denominator Statement: N/A

Exclusions: N/A

Adjustment/Stratification: None

Level of Analysis: Clinician : Group/Practice, Other

Setting of Care: Inpatient/Hospital

Type of Measure: Structure

Data Source: Registry Data

Measure Steward: The Society of Thoracic Surgeons

STANDING COMMITTEE MEETING 07/10/2019

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

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

1a. Evidence: **H-0; M-12; L-1; I-1**; 1b. Performance Gap: **H-0; M-13; L-1; I-0**

Rationale:

- For the 2014 endorsement evaluation, the Committee had no concerns with the systematic review provided showing a link between improved quality and participation in a national database. For the current evaluation, the developer indicated no changes in the evidence since the measure was last evaluated; however, a systematic review showing linkage between improved quality and participation in national database that the previous Committee referenced was not provided. Like #0732, the Committee discussed whether evidence inferred from published accounts of improved quality following participation in the STS General Thoracic Surgery Database (GTSD) and other national databases is enough to support measuring physician participation in a registry leads to a desired health outcome.
- The developer reported that the 2013 STS Congenital Heart Surgery Database Report contained data from 108 of the 125 hospitals in the United States and 3 of the 8 hospitals in Canada.
- The Committee discussed similar issues related to evidence and performance gap related to measure 0456. The Committee's discussion included whether the evidence and performance data provided were enough and met NQF criteria.

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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: **M-12; L-1; I-1**; 2b. Validity: **M-13; L-0; I-1**

Rationale:

- Measure specifications as submitted by the developer were incomplete and included a numerator statement only. Denominator, measurement time window, definitions, and other details needed to consistently implement measure not provided.
- The developer presented data element validity testing to demonstrate both reliability and validity. The developer provided agreement rates from a 2013 audit of 8 STS GTSD participants. Data was re-abstracted for 20 cases and 14 individual data elements were compared with those previously submitted to the data warehouse. Percent agreement rates were provided for 14 data elements and overall percent agreement rate.
- Some Committee members agreed the measure was reliable and valid while others expressed their concerns about the validity of the measure. Members of the Committee noted the degree of participation should be clearly defined in the specifications. The Committee also questioned if participating in the registry translated into quality. Additionally, members noted only indirect evidence that registry participation improves patient outcomes was provided and there was no performance data on non-participating sites.

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3. Feasibility: H-4; M-9; L-1; 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 developer reports there are no direct costs to collect the data for this measure. The participation fee for the General Thoracic Surgery Database is on a per surgeon basis. For each surgeon joining that is an STS member, the fee is $550. For each surgeon joining that is not an STS member, the fee is $700.
- The Committee noted that the measure requires substantial institutional commitment to participate and data extraction by chart abstractors is required.

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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-13; No Pass-1** *4b. Usability:* **H-2; M-11; L-0; I-1**

Rationale:

- The developer reported that data from the Congenital Heart Surgery Database (CHSD) has been publicly reported since January 2015, it is not clear if and/how the performance results from this measure are used and publicly reported.
- The developer show steady growth in voluntary participation in CHSD public reporting since 2015 demonstrates progress towards achieving high-quality, efficient healthcare.

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5. Related and Competing Measures

- This measure is related to:
    - 0113: Participation in a Systematic Database for Cardiac Surgery
    - 0456: Participation in a Systematic National Database for General Thoracic Surgery

    - 0493: Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures
    - 0493: Participation by a Physician or Other Clinician in Systematic Clinical Database Registry that Includes Consensus Endorsed Quality Measures (Endorsement Removed)
- The Committee will discuss related and competing measures during the post-comment call on September 23, 2019.

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6. Standing Committee Recommendation for Endorsement: **Y-13**; **N-1**

Rationale

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7. Public and Member Comment

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8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

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9. Appeals

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Submission | Specifications

Description: This measure is a re-specified version of the measure, "Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)" (NQF 1550), which was developed for patients 65 years and older using Medicare claims data. This re-specified measure attributes outcomes to MIPS participating Eligible Clinicians and/or Eligible Clinician Groups ("providers"), rather than to hospitals, and assesses each provider's complication rate, 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).

Numerator Statement: 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 other than mortality are counted in the measure only if they occur during the index hospital admission or during a readmission. This outcome is identical to that of the original hospital measure. Additional details are provided in S.5 Numerator Details.

Denominator Statement: The target population for the measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age who have undergone elective primary THA and/or TKA procedures.

Attribution of Index Admissions to Eligible Clinicians

Each patient index admission (the admission during which the patient has the eligible THA/TKA procedure), and therefore their outcome (complication or no complication) is attributed to the Eligible Clinician who bills for the procedure (Billing Surgeon). Conceptually, the Billing Surgeon is the Clinician with the primary responsibility for the procedure and procedure related care.

In practice, patients may have different claims for the same procedure, and so the billing surgeon is assigned through an algorithm that resolves ambiguities in billing. The algorithm uses billing claims to identify the clinician(s) who bills for a THA (CPT® code 27130) or TKA (CPT®® code 27447 or CPT® code 27446) (steps 1-3 below). These CPT® codes are representative of the THA and/or TKA procedures included in the measure cohort.

1. If only one clinician bills for a THA (CPT® code 27130) or TKA (CPT® code 27446 or 27447) for a patient, the algorithm identifies and assigns this individual as the Billing Surgeon.
2. If two or more clinicians bill for THA/TKA procedures (CPT® 27130, 27447, or 27446), the algorithm seeks to identify a 'key' physician among them. The algorithm identifies and excludes assignment to clinicians who were assistants-at-surgery (assistant surgeon with CPT® modifier 80 or 82, minimum assistant surgeon with CPT® modifier 81). In this step, the algorithm assigns the Billing Surgeon as the clinician who billed for a THA or TKA procedure and is not an assistant-at-surgery.
3. If a single clinician who is not an assistant-at-surgery could not be identified for assignment, then the algorithm identifies whether there is a single clinician who was an orthopedic surgeon (Medicare Specialty Code 20) and assigns this as the Billing Surgeon.
4. If the algorithm cannot identify a Billing Surgeon, it identifies whether an Operator is listed on the institutional claim. The algorithm then defaults assignment to the Operator listed on the institutional claim.

Finally, if a Billing Surgeon or Operator cannot be identified with the steps above, the patient is not assigned to a clinician or group and is excluded from the measure.

Attribution of Index Admissions to an Eligible Clinician Group

CMS needs the flexibility to assign each eligible patient index admission to at least one Eligible Clinician and at least one Eligible Clinician group. This allows them the ability to report at either the Eligible Clinician or the Eligible Clinician Group level. Conceptually, these assignments should represent a consistent group of clinicians. That is, it would be confusing to assign a patient to Eligible Clinician A and also to Eligible Clinician Group B if Eligible Clinician A is not in that Group. The attribution methodology addresses this by using both individual and group identifiers.

Every Medicare Eligible Clinician has a unique National Provider Identifier (NPI). Similarly, every Medicare Eligible Clinician Group has one or more Tax Identification Numbers (TINs), reflecting their practice setting(s). Each Eligible Clinician claim should include both their NPI and a TIN which identifies their "group" (which may consist only of that clinician if they are solo providers). Therefore, we identify clinicians for each patient index admission through the unique National Provider ID (NPI) and Tax ID (TIN) combination listed on a patient's claim. For a Billing Surgeon, the NPI and TIN are those on the procedure claim used to attribute the patient index admission. To identify the unique TIN/NPI combination for the Operator, the Operator's NPI is matched to the TIN with the most Part B allowed charges during the index admission or during the measurement year if the Operator did not bill during the index admission. Most NPIs are associated with only one TIN. A Clinician Group is set of Clinicians (NPI-TIN combinations) assigned to the same TIN.

Additional details are provided in S.7 Denominator Details.

Exclusions: This measure excludes index admissions for patients:

1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge;
2. Who were transferred in to the index hospital;
3. Who leave the hospital against medical advice (AMA);
4. With more than two THA/TKA procedures codes during the index hospitalization; or
5. Who cannot be attributed to a billing surgeon or operator using claims data

After applying the exclusion criteria above, 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.

Adjustment/Stratification: Statistical risk model

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

Setting of Care: Inpatient/Hospital, Outpatient Services

Type of Measure: Outcome

Data Source: Claims, Enrollment Data

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

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: **Pass-17; No Pass-0**; 1b. Performance Gap: **H-2; M-15; L-0; I-0**

Rationale:

- Because this is a re-specified measure (1550), the Committee questioned whether the distinctions between 1550 and 3493 were great enough to justify having both hospital and

provider versions. The Committee discussed that complication rates can be brought down by standardization of process and agreed that there was great value to having provider-level outcomes data available.

- The Committee agreed that there is significant variation in complication rates, as evidenced by the hospital measure (1550), which demonstrates first and tenth decile rates of 1.9% and 4.3%). Additionally, for the clinician level, the risk-standardized measure scores had a mean (SD) of 2.83% (0.65%) and for the clinician group level, the risk-standardized measure scores had a mean (SD) of 2.81% (0.51%), demonstrating a performance gap that the Committee deemed moderate.

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

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

2a. Reliability: **H-2; M-14; L-1; I-0**; 2b. Validity: **H-2; M-13; L-2; I-0**

<u>Rationale</u>:

- This measure was reviewed by the Scientific Methods Panel (SMP) and passed both reliability and validity.
- Reliability testing was conducted at the measure score level and used Adams method to estimate entity-level reliability. The entity-level reliability testing indicated that for entities with 25 procedures or more, the median signal-to-noise ratio reliability was 0.793 [IQR 0.695-0.878] for clinicians, and 0.790 [IQR 0.647-0.907] for clinician groups. The median reliability scores reflected the reliability of the hospital-level measure score (NQF 1550).
- Validity testing was demonstrated through empirical validity testing and by systematic assessment of the measure's face validity by a technical expert panel (TEP) of national experts and stakeholder organizations. For empirical validity testing, the developer examined the relationship between volume and the measure score for clinicians and clinician groups. Correlations between volume and measure score were calculated for each provider type, and the measure score for each decile of volume was summarized. There was a moderate, yet meaningful, inverse relationship between volume and measure outcome for both clinicians (correlation coefficient of -0.2379; $p<0.0001$) and clinician groups (correlation coefficient of -0.19026; $p<0.0001$). Furthermore, the TEP supported the final measure with high agreement.
- The Committee addressed a comment made by the American Medical Association (AMA) that questioned whether the case minimum of 25 cases was acceptable, given the low reliability results (0.582 to 0.988 and 0.463 to 0.996 for clinicians and clinician groups, respectively). The developer reported that the 25 cases provided was acceptable reliability while capturing lower volume providers.
- The Committee noted that the database is an administrative database for CMS that is based on submitted diagnosis codes for billing, which is less valid than registry data.
- The Committee discussed a comment made by the AMA that stated additional testing is needed to evaluate clinical factors in conjunction with social risk factors, as opposed to prioritizing clinical factors. The Committee agreed that including volume as a risk adjuster would not identify important modifiable risk factors that the measure should identify.
- The Committee raised questions regarding the inclusion criteria for the measure: continuous 12-month enrollment in Medicare Part A. The developer clarified that this criterion is in place to ensure that all co-morbidities are captured adequately for risk adjustment, as well

as for the duration that they are evaluating for complications. Additionally, it was pointed out that this measure is specified for fee-for-service (FFS) beneficiaries only and therefore does not capture Medicare Advantage patients.
- It was recommended that it would be worth researching whether there is a substantial difference between FFS beneficiaries and those enrolled in Medicare Advantage. Since Medicare Advantage is more cost-effective for parts of the country, leaving out this population may blunt an important socioeconomic risk adjustment.

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3. Feasibility: H-6; M-11; 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 data elements can be found in defined fields in electronic claims, and administrative data are routinely collected as part of the billing process. The measure was designed to capture data that are already present in administrative data collection. There are no fees, licensing, or other requirements reported to use any aspect of the measure.
- NQF measure 1550 was deemed feasible when it was originally evaluated and endorsed. The Committee agreed that feasibility is moderate to high for this measure.

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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-3; M-13; L-1; I-0**

Rationale:

- Since this is a new measure, there are currently no public reporting targets. However, per the developer, the primary goal of the measure is to provide information necessary to implement focused quality improvement efforts.
- The Committee discussed that expanding this measure to all-payer or to a broader population would have great usability.

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5. Related and Competing Measures

- This measure is harmonized with measure 1550 regarding cohort definition, outcome, and risk adjustment approach. The only discrepancy is the attribution approach, but instead of assigning each index admission to a hospital (1550), it assigns it to a clinician or a clinician group.

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6. Standing Committee Recommendation for Endorsement: **Y-17**; **N-0**

Rationale

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7. Public and Member Comment

8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

9. Appeals

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Submission | Specifications

Description: This measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 90 days of the procedure date of an index CABG admission. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. This measure may be used in one or more to be defined 90-day payment models.

Numerator Statement: The outcome for this measure is 90-day all-cause mortality. Mortality is defined as death for any reason within 90 days of the procedure date from the index admission for patients 65 and older discharged from the hospital after undergoing isolated CABG surgery.

Denominator Statement: This claims-based measure can be used in the patient cohort aged 65 years or older.

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 the measure period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

Exclusions: The 90-day CABG surgery mortality measure excludes index admissions for patients:

1) With inconsistent or unknown vital status or other unreliable data.
2) Who leave the hospital against medical advice (AMA).
3) With qualifying CABG procedures subsequent to another qualifying CABG procedure during the measurement period.

Adjustment/Stratification: Statistical risk model

Level of Analysis: Facility

Setting of Care: Inpatient/Hospital

Type of Measure: Outcome

Data Source: Claims

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

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: **Pass-17; No Pass-0**; 1b. Performance Gap: **H-4; M-13; L-0; I-0**

Rationale:

- Data submitted by the developers suggest that the quality of and variation in care delivered during and after surgery influence patients' mortality rates within the initial 90 days and

beyond; and that the cultural and leadership improvements were significantly associated with improved risk-standardized mortality.
- The Committee agreed that reducing healthcare costs while incentivizing multidisciplinary care, improving communication among providers involved in care transition, and encouraging strategies that promote disease management lead to improved patient health and decreased risk of mortality following coronary artery bypass graft (CABG) surgery.
- The developer provided 90-Day Risk-Standardized Mortality Rates from Medicare Claims data with a mean of 4.86%, range of 2.04-11.26%, median risk-standardized rate of 4.67%, and 25th and 75th percentiles of 4.08% and 5.49%, respectively. The developer also provided disparities data on 90-day risk-standardized mortality rate (RSMRS) by proportion of patients with social risk (dual eligible patients and AHRQ SES Index Scores). Based on the data provided, the Committee agreed that there is an opportunity for improvement that warrants a national performance measure.

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

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

2a. Reliability: **H-5; M-10; L-2; I-0**; 2b. Validity: **H-3; M-12; L-2; I-0**

<u>Rationale</u>:

- NQF's Scientific Methods Panel evaluated reliability and validity, rating both as "High."
- The developer tested reliability using score-level testing via split-sample signal-to-noise analysis limited to hospitals with at least 25 admissions. The Committee agreed that the median reliability score of 0.84, ranging from 0.57 to 0.98, and the 25th and 75th percentiles of 0.76 and 0.90, respectively, demonstrated reliability.
- The developer demonstrated validity through score-level testing, and no data element level validity testing was provided. Empirical validity testing was conducted comparing the 90-day CABG mortality measure results against the STS star rating categories with the median (IQR) 90-day all-cause CABG mortality RSMR of 5.89% (4.88%-6.76%) for hospitals with one-star rating, 4.57% (3.93%-5.32%) for two-star hospitals, and 3.71% (3.23%-4.23%) for three-star hospitals. The data demonstrates an observed trend of lower risk-standardized mortality with higher star rating, which supports measure score validity. The Committee agreed with the Scientific Methods Panel that the measure meets NQF validity criteria.

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3. Feasibility: H-6; M-11; 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)

<u>Rationale</u>:

- Because the measure is specified for administrative claims data, the Committee agreed that it meets NQF's feasibility criterion. The Committee expressed no other concerns regarding the feasibility of this measure.

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-2; M-14; L-1; I-0**

Rationale:

- The developer suggested that this measure is not currently publicly reported or used in a payment program since it is a new measure but may ultimately be used in one or more CMS programs.
- The Committee identified no concerns regarding the use and usability of this measure.

5. Related and Competing Measures

- This measure is related to:
    - NQF #0230 - Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older
    - NQF # 0119 - Risk-Adjusted Operative Mortality for CABG (STS)
    - NQF # 2515 - Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery
    - NQF #2558 - Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) surgery
    - NQF # 0123- Risk-adjusted operative mortality for aortic valve replacement (AVR) + CABG surgery (STS)
    - NQF # 0122- Risk-adjusted operative mortality for mitral valve (MV) replacement + CABG surgery (STS)
    - NQF # 1502- Risk-adjusted operative mortality for MV repair + CABG surgery (STS)
- The Committee will discuss related and competing measures during the post-comment call on September 23, 2019.

6. Standing Committee Recommendation for Endorsement: **Y-17**; **N-0**

Rationale

7. Public and Member Comment

8. Consensus Standards Approval Committee (CSAC) Vote: Y-X; N-X

9. Appeals

Appendix B: Surgery Portfolio—Use in Federal Programs[a]

NQF #	Title	Federal Programs: Finalized or Implemented as of July 10, 2019
0456	Participation in a Systematic National Database for General Thoracic Surgery	N/A
0564/3056	Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0565/3057	Cataracts: 20/40 or Better Visual Acuity within 90 Days Following Cataract Surgery	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
1790	Risk-Adjusted Morbidity and Mortality for Lung Resection for Lung Cancer	N/A
3294	STS Lobectomy for Lung Cancer Composite Score	N/A
3357	Facility Level 7-Day Hospital Visits after General Surgery Procedures Performed at Ambulatory Surgical Centers	N/A
0697	Risk Adjusted Case Mix Adjusted Elderly Surgery Outcomes Measure	N/A
0706	Risk Adjusted Colon Surgery Outcome Measure	N/A
0127	Preoperative Beta Blockade	N/A
0134	Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG)	N/A
1519	Statin Therapy at Discharge after Lower Extremity Bypass (LEB)	N/A
1523	Rate of Open Repair of Abdominal Aortic Aneurysms (AAA) Where Patients Are Discharged Alive	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
1534	In-hospital mortality following elective EVAR of AAAs	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
1540	Postoperative Stroke or Death in Asymptomatic Patients undergoing Carotid Endarterectomy	Merit-Based Incentive Payment System (MIPS) Program (Implemented)

[a] Per CMS Measures Inventory Tool as of 7/22/2019

NQF #	Title	Federal Programs: Finalized or Implemented as of July 10, 2019
1550	Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	Hospital Compare (Implemented), Hospital Inpatient Quality Reporting (Implemented; To be removed 2022-10-01), Hospital Value-Based Purchasing (Implemented)
1551	Hospital-level 30-day, all-cause risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	Hospital Compare (Implemented), Hospital Inpatient Quality Reporting (Implemented, To be removed 2019-10-01), Hospital Readmission Reduction Program (Implemented)
0114	Risk-Adjusted Postoperative Renal Failure	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0115	Risk-Adjusted Surgical Re-exploration	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0117	Beta Blockade at Discharge	N/A
0118	Anti-Lipid Treatment Discharge	N/A
0119	Risk-Adjusted Operative Mortality for CABG	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0120	Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)	N/A
0121	Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement	N/A
0122	Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery	N/A
0123	Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery	N/A
0127	Preoperative Beta Blockade	N/A
0129	Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0130	Risk-Adjusted Deep Sternal Wound Infection	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0131	Risk-Adjusted Stroke/Cerebrovascular Accident	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0134	Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG)	N/A

NQF #	Title	Federal Programs: Finalized or Implemented as of July 10, 2019
0236	Coronary Artery Bypass Graft (CABG): Preoperative Beta-Blocker in Patients with Isolated CABG Surgery	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0339	RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)	N/A
0340	RACHS-1 Pediatric Heart Surgery Volume (PDI 7)	N/A
0354	Hip Fracture Mortality Rate (IQI 19)	N/A
0357	Abdominal Aortic Aneurysm (AAA) Repair Volume (IQI 4)	N/A
0359	Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate (IQI 11)	N/A
0365	Pancreatic Resection Mortality Rate (IQI 9)	N/A
0366	Pancreatic Resection Volume (IQI 2)	N/A
0465	Perioperative Anti-platelet Therapy for Patients undergoing Carotid Endarterectomy	Merit-Based Incentive Payment System (MIPS) Program (Finalized; To be removed 2020-10-01)
0533	Postoperative Respiratory Failure Rate (PSI 11)	N/A
0564	Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
0696	STS CABG Composite Score (Composite Measure)	N/A
0697	Risk Adjusted Case Mix Adjusted Elderly Surgery Outcomes Measure	N/A
0706	Risk Adjusted Colon Surgery Outcome Measure	N/A
0732	Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	N/A
0733	Operative Mortality Stratified by the 5 STAT Mortality Categories	Merit-Based Incentive Payment System (MIPS) Program (Finalized)

NQF #	Title	Federal Programs: Finalized or Implemented as of July 10, 2019
0734	Participation in a National Database for Pediatric and Congenital Heart Surgery	N/A
1501	Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair	N/A
1502	Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery	N/A
1543	Postoperative Stroke or Death in Asymptomatic Patients undergoing Carotid Artery Stenting (CAS)	Merit-Based Incentive Payment System (MIPS) Program (Implemented)
1790	Risk-Adjusted Morbidity and Mortality for Lung Resection for Lung Cancer	N/A
2038	Performing vaginal apical suspension at the time of hysterectomy to address pelvic organ prolapse	N/A
2063	Performing cystoscopy at the time of hysterectomy for pelvic organ prolapse to detect lower urinary tract injury	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
2558	Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery	Hospital Compare (Implemented), Hospital Inpatient Quality Reporting (Implemented; To be removed 2021-10-01), Hospital Value-Based Purchasing (Finalized; Implemented 2021-10-01)
2561	STS Aortic Valve Replacement (AVR) Composite Score (Composite Measure)	N/A
2563	STS Aortic Valve Replacement (AVR) + Coronary Artery Bypass Graft (CABG) Composite Score (Composite Measure)	N/A
2677	Preoperative evaluation for stress urinary incontinence prior to hysterectomy for pelvic organ prolapse	N/A
2681	Perioperative Temperature Management	Merit-Based Incentive Payment System (MIPS) Program (Finalized)
2683	Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	N/A
2687	Hospital Visits after Hospital Outpatient Surgery	Hospital Outpatient Quality Reporting (Finalized; To be implemented 2020-01-01)

NQF #	Title	Federal Programs: Finalized or Implemented as of July 10, 2019
3030	STS Individual Surgeon Composite Measure for Adult Cardiac Surgery (Composite Measure)	N/A
3031	STS Mitral Valve Repair/Replacement (MVRR) Composite Score (Composite Measure)	N/A
3032	STS Mitral Valve Repair/Replacement (MVRR) + Coronary Artery Bypass Graft (CABG) Composite Score (Composite Measure)	N/A

Appendix C: Surgery Standing Committee and NQF Staff

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Appendix D: Measure Specifications

0456 Participation in a Systematic National Database for General Thoracic Surgery

STEWARD

The Society of Thoracic Surgeons

DESCRIPTION

Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.

TYPE

Structure

DATA SOURCE

Registry Data STS General Thoracic Surgery Database – Version 2.2

LEVEL

Clinician : Group/Practice

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures

NUMERATOR DETAILS

Participation in the STS General Thoracic Surgery Database is initiated by the surgeons and or/hospital and requires semiannual submission via an approved software system to the Duke Clinical Research Institute (DCRI), the data repository for the three STS Databases. The General Thoracic Surgery Database accepts data from General Surgeons performing Thoracic procedures as well as Thoracic Surgeons.

DENOMINATOR STATEMENT

N/A

DENOMINATOR DETAILS

N/A

EXCLUSIONS

N/A

EXCLUSION DETAILS

N/A

RISK ADJUSTMENT

No risk adjustment or risk stratification

STRATIFICATION

N/A

TYPE SCORE

Categorical, e.g., yes/no passing score defines better quality

ALGORITHM

See S.4 - S.5

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None

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

STEWARD

The Society of Thoracic Surgeons

DESCRIPTION

Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

TYPE

Outcome

DATA SOURCE

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

LEVEL

Clinician : Group/Practice

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

NUMERATOR DETAILS

Number of index pediatric and/or congenital heart surgery operations with an operative mortality;

Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0):

1. Mortality status at database discharge (MtDBDisStat)
2. Status at 30 days after surgery (Mt30Stat)

DENOMINATOR STATEMENT

All patients undergoing index pediatric and/or congenital heart surgery

DENOMINATOR DETAILS

Number of index pediatric and/or congenital heart surgery operations. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations,

please refer to the data collection form and data specifications documents which can be accessed using the URLs provided in S.1 above.

EXCLUSIONS

- Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure.
- All operations where the primary procedure is either pectus repair or bronchoscopy are not classified as cardiac operations (i.e., they are thoracic procedures) and thus, they are excluded from the denominator

EXCLUSION DETAILS

Weight in kilograms [WeightKg (STS Congenital Heart Surgery Database Version 3.0)] = 2.5 kg and primary procedure (PrimProc) is marked “1330 = PDA closure, Surgical”; primary procedure (PrimProc) is marked “1430 = Pectus repair” or “1870 = Bronchoscopy”

RISK ADJUSTMENT

Statistical risk model

STRATIFICATION

N/A

TYPE SCORE

Rate/proportion better quality = lower score

ALGORITHM

Please refer to numerator and denominator sections for detailed information.

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None

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

STEWARD

The Society of Thoracic Surgeons

DESCRIPTION

Surgical volume for pediatric and congenital heart surgery: total programmatic volume and programmatic volume stratified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

TYPE

Structure

DATA SOURCE

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

LEVEL

Clinician : Group/Practice

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

1) Total number of pediatric and congenital cardiac surgery operations and 2) number of pediatric and congenital cardiac surgery operations in each of the strata of complexity specified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

NUMERATOR DETAILS

Please see Appendix.

DENOMINATOR STATEMENT

N/A

DENOMINATOR DETAILS

N/A

EXCLUSIONS

N/A

EXCLUSION DETAILS

N/A

RISK ADJUSTMENT

Stratification by risk category/subgroup

STRATIFICATION

Please see Appendix

TYPE SCORE

Count better quality = higher score

ALGORITHM

Please refer to numerator section and Appendix for detailed information.

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None

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

STEWARD

The Society of Thoracic Surgeons

DESCRIPTION

Percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Categories, a multi-institutional validated risk stratification tool

TYPE

Outcome

DATA SOURCE

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

LEVEL

Clinician : Group/Practice

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Levels, a multi-institutional validated complexity stratification tool

NUMERATOR DETAILS

Number of index pediatric and/or congenital heart surgery operations with an operative mortality;

Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0):

1. Mortality status at database discharge (MtDBDisStat)
2. Status at 30 days after surgery (Mt30Stat)

DENOMINATOR STATEMENT

All patients undergoing index pediatric and/or congenital heart surgery

DENOMINATOR DETAILS

Number of index cardiac operations in each level of complexity stratification using the 5 STAT Mortality Categories, a multi-institutional validated complexity stratification tool. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations and their respective STAT category, please see the Appendix.

EXCLUSIONS

N/A

EXCLUSION DETAILS

N/A

RISK ADJUSTMENT

Stratification by risk category/subgroup

STRATIFICATION

Please see Appendix

TYPE SCORE

Rate/proportion better quality = lower score

ALGORITHM

Please refer to numerator and denominator sections as well as the attachments for detailed information.

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None

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

STEWARD

The Society of Thoracic Surgeons

DESCRIPTION

Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.

TYPE

Structure

DATA SOURCE

Registry Data STS Congenital Heart Surgery Database Version 3.22

LEVEL

Clinician : Group/Practice, Other

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.

NUMERATOR DETAILS

Participation is defined as submission of all congenital and pediatric operations performed to the database.

DENOMINATOR STATEMENT

N/A

DENOMINATOR DETAILS

N/A

EXCLUSIONS

N/A

EXCLUSION DETAILS

N/A

RISK ADJUSTMENT

No risk adjustment or risk stratification

STRATIFICATION

N/A

TYPE SCORE

Categorical, e.g., yes/no passing score defines better quality

ALGORITHM

See S.4 - S.5

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None

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

STEWARD

Centers for Medicare & Medicaid Services (CMS)

DESCRIPTION

This measure is a re-specified version of the measure, “Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)” (NQF 1550), which was developed for patients 65 years and older using Medicare claims data. This re-specified measure attributes outcomes to MIPS participating Eligible Clinicians and/or Eligible Clinician Groups (“providers”), rather than to hospitals, and assesses each provider’s complication rate, 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).

TYPE

Outcome

DATA SOURCE

Claims, Enrollment Data Medicare administrative claims and enrollment data

LEVEL

Clinician : Group/Practice, Clinician : Individual

SETTING

Inpatient/Hospital, Outpatient Services

NUMERATOR STATEMENT

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 other than mortality are counted in the measure only if they occur during the index hospital admission or during a readmission. This outcome is identical to that of the original hospital measure. Additional details are provided in S.5 Numerator Details.

NUMERATOR DETAILS

Outcome Definition

The composite complication is a dichotomous outcome (yes for any complication(s); no for no complications) occurring within 90 days post-date of the index admission. Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes." The measure includes the following surgical complications: surgical site bleeding, mechanical complications, periprosthetic joint infection/wound infection; and also includes death as a complication. The measure also includes the following medical complications, as they are important in measuring overall quality: acute myocardial infarction (AMI), pneumonia, pulmonary embolism, and sepsis/septicemia/shock. 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. This outcome definition is identical to the Hospital-level RSCR following elective primary THA and/or TKA" (NQF 1550).

The measure assesses a dichotomous yes or no outcome of whether each admitted patient experiences one or more of the complications defined below. Complications other than mortality are counted in the measure only if they occur during the index admission or require a readmission. The measure does not count complications that occur in the outpatient setting and do not require a readmission. The outcome is aligned with CMS's hospital-level THA/TKA complication measure.

The measure defines a "complication" as:

- Acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia/shock during the index admission or a subsequent inpatient admission that occurs within 7 days from the start of the index admission;
- Surgical site bleeding or pulmonary embolism during the index admission or a subsequent inpatient admission within 30 days from the start of the index admission;
- Death during the index admission or within 30 days from the start of the index admission;
- Mechanical complication or periprosthetic joint infection/wound infection during the index admission or a subsequent inpatient admission that occurs within 90 days from the start of the index admission. (See attached Data Dictionary for list of ICD-9 and 10 codes used to define complications).

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.

For the full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheets HK Complications I10-Outcome" and "Complication Codes ICD9."

DENOMINATOR STATEMENT

The target population for the measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age who have undergone elective primary THA and/or TKA procedures.

Attribution of Index Admissions to Eligible Clinicians

Each patient index admission (the admission during which the patient has the eligible THA/TKA procedure), and therefore their outcome (complication or no complication) is attributed to the Eligible Clinician who bills for the procedure (Billing Surgeon). Conceptually, the Billing Surgeon is the Clinician with the primary responsibility for the procedure and procedure related care.

In practice, patients may have different claims for the same procedure, and so the billing surgeon is assigned through an algorithm that resolves ambiguities in billing. The algorithm uses billing claims to identify the clinician(s) who bills for a THA (CPT® code 27130) or TKA (CPT®® code 27447 or CPT® code 27446) (steps 1-3 below). These CPT® codes are representative of the THA and/or TKA procedures included in the measure cohort.

1. If only one clinician bills for a THA (CPT® code 27130) or TKA (CPT® code 27446 or 27447) for a patient, the algorithm identifies and assigns this individual as the Billing Surgeon.

2. If two or more clinicians bill for THA/TKA procedures (CPT® 27130, 27447, or 27446), the algorithm seeks to identify a 'key' physician among them. The algorithm identifies and excludes assignment to clinicians who were assistants-at-surgery (assistant surgeon with CPT® modifier

80 or 82, minimum assistant surgeon with CPT® modifier 81). In this step, the algorithm assigns the Billing Surgeon as the clinician who billed for a THA or TKA procedure and is not an assistant-at-surgery.

3. If a single clinician who is not an assistant-at-surgery could not be identified for assignment, then the algorithm identifies whether there is a single clinician who was an orthopedic surgeon (Medicare Specialty Code 20) and assigns this as the Billing Surgeon.

4. If the algorithm cannot identify a Billing Surgeon, it identifies whether an Operator is listed on the institutional claim. The algorithm then defaults assignment to the Operator listed on the institutional claim.

Finally, if a Billing Surgeon or Operator cannot be identified with the steps above, the patient is not assigned to a clinician or group and is excluded from the measure.

Attribution of Index Admissions to an Eligible Clinician Group

CMS needs the flexibility to assign each eligible patient index admission to at least one Eligible Clinician and at least one Eligible Clinician group. This allows them the ability to report at either the Eligible Clinician or the Eligible Clinician Group level. Conceptually, these assignments should represent a consistent group of clinicians. That is, it would be confusing to assign a patient to Eligible Clinician A and also to Eligible Clinician Group B if Eligible Clinician A is not in that Group. The attribution methodology addresses this by using both individual and group identifiers.

Every Medicare Eligible Clinician has a unique National Provider Identifier (NPI). Similarly, every Medicare Eligible Clinician Group has one or more Tax Identification Numbers (TINs), reflecting their practice setting(s). Each Eligible Clinician claim should include both their NPI and a TIN which identifies their "group" (which may consist only of that clinician if they are solo providers). Therefore, we identify clinicians for each patient index admission through the unique National Provider ID (NPI) and Tax ID (TIN) combination listed on a patient's claim. For a Billing Surgeon, the NPI and TIN are those on the procedure claim used to attribute the patient index admission. To identify the unique TIN/NPI combination for the Operator, the Operator's NPI is matched to the TIN with the most Part B allowed charges during the index admission or during the measurement year if the Operator did not bill during the index admission. Most NPIs are associated with only one TIN. A Clinician Group is set of Clinicians (NPI-TIN combinations) assigned to the same TIN.

Additional details are provided in S.7 Denominator Details.

DENOMINATOR DETAILS

To be included in the measure cohort used, 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 and for 90 days after discharge;

2. Aged 65 or older; and

3. Having a qualifying elective primary THA/TKA procedure.

Elective primary THA/TKA procedures are defined as those procedures without any of the following:

1. Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission

2. 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

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

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.

Elective primary THA/TKA procedures are defined as those procedures without any of the 8 associated conditions or finding noted above.

For a full list of ICD-9 and ICD-10 codes defining the following see attached Data Dictionary, sheets “I-10 Cohort Codes” and “I9 Cohort Codes.”

Additional details are provided in S.9 Denominator Details.

EXCLUSIONS

This measure excludes index admissions for patients:

1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge;

2. Who were transferred in to the index hospital;

3. Who leave the hospital against medical advice (AMA);

4. With more than two THA/TKA procedures codes during the index hospitalization; or

5. Who cannot be attributed to a billing surgeon or operator using claims data

After applying the exclusion criteria above, 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.

EXCLUSION DETAILS

The measure excludes admissions for patients:

1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge

Rationale: Only patients with adequate claims data for attribution should be included in risk-adjustment model and the measure.

2. Who were transferred in to the index hospital

Rationale: If the patient is transferred from another acute care facility to the hospital where the index procedure occurs, it is likely that the procedure is not elective, or that the admission is associated with an acute condition.

3. Who leave the hospital against medical advice (AMA)

Rationale: Clinicians have limited opportunity to implement high quality care.

4. With more than two THA/TKA procedures 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, and this may reflect a coding error.

5. Who cannot be attributed to a billing surgeon or operator using claims data

Rationale: Only patients with adequate clinician claims for attribution should be included in risk-adjustment model and the measure.

RISK ADJUSTMENT

Statistical risk model

STRATIFICATION

N/a

TYPE SCORE

Rate/proportion better quality = lower score

ALGORITHM

In Dataset April 2013 to March 2016 (prior to exclusions being applied): We started with the hospital HKC measure cohort, with an initial index cohort size of 982,436 index admissions with an elective primary THA/TKA procedure. After applying exclusion criteria 1 through 4 listed in the table below, we have a cohort sample size of 935,029 index admissions. Our previous NQF filing for hospital HKC showed no bias introduced through the exclusion process for hospitals for this same cohort of 935,029 index admissions. We then further excluded 10,243 (1.0%) index admissions (criteria 5 and 6 below) which cannot be attributed to physician/physician group to create our final measure cohort.

The measure estimates eligible clinician or clinician group ("provider")-level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and provider 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 provider-specific intercept. At the provider level, it models the provider-specific intercepts as arising from a normal distribution. The provider intercept represents the underlying risk of a complication for patients treated by the provider, after accounting for patient risk. The provider-specific intercepts are given a distribution to account for the clustering (non-independence) of patients treated by the same provider. If there were no differences among providers, then after adjusting for patient risk, the provider intercepts should be identical across all providers.

The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given provider, multiplied by the national observed complication rate. The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the provider-specific intercept on the risk of having an admission with a complication. The estimated provider-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 provider 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 providers in our sample is added in place of the provider-specific effect. The results are

log transformed and summed over all patients in the provider to get an expected value. To assess provider performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

For each provider, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the provider's performance with its observed case mix, and the denominator is the number of complications expected based on the nation's performance with that provider'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 provider's performance given its case mix to an average provider'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.

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

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3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

STEWARD

Centers for Medicare & Medicaid Services (CMS)

DESCRIPTION

This measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 90 days of the procedure date of an index CABG admission. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. This measure may be used in one or more to be defined 90-day payment models.

TYPE

Outcome

DATA SOURCE

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 (2009-2013): We examined disparities in performance according to the proportion of patients in each hospital who were dual eligible for both Medicare and Medicaid insurances. We also used the Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status (SES) index score derived from the American Community Survey (2009-2013) to study the association between our measure and SES.

Master Beneficiary Summary File (MBSF)

The MBSF is an annually created file that contains enrollment information for all Medicare beneficiaries, including dual eligible status. Years 2014-2017 were used.

The Society of Thoracic Surgeons (STS) CABG Composite Online Star Ratings

Empiric validity testing was performed using the publicly available measure score of the Society of Thoracic Surgery (STS) CABG Composite Online Star Rating, which combines several measures across quality domains to score hospitals from one (low quality) to three (high quality) stars (The Society of Thoracic Surgeons, 2017).

References

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.

The Society of Thoracic Surgeons. STS Public Reporting Online. CABG Overall Composite Score. 2017. Available at:https://publicreporting.sts.org/search/cabg_report_card/hospital?title=&field_year_target_id=11&field_state_value=All. Accessed December 1, 2018.

LEVEL

Facility

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

The outcome for this measure is 90-day all-cause mortality. Mortality is defined as death for any reason within 90 days of the procedure date from the index admission for patients 65 and older discharged from the hospital after undergoing isolated CABG surgery.

NUMERATOR DETAILS

This is an all-cause mortality measure, therefore any death within 90 days of the index procedure date from the index hospitalization is included in the measure outcome. We identify deaths for Medicare FFS patients 65 years or older using the Medicare Enrollment Database (EDB).

Numerator time window: 90 days from the procedure date of index CABG procedure.

This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define the outcome and to which hospital the outcome is attributed when there are multiple hospitalizations within a single episode of care.

Outcome Attribution:

Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves an index CABG procedure (i.e., the patient is either transferred into the hospital that performs the index CABG or is transferred out to another hospital following the index CABG) 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 90-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 90-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 90-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

This claims-based measure can be used in the patient cohort aged 65 years or older.

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 the measure period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.

DENOMINATOR DETAILS

The measure includes index admissions for patients:

1. Having a qualifying isolated CABG surgery during the index admission;
2. Enrolled in Medicare 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:

- Valve procedures;
- Atrial and/or ventricular septal defects;
- Congenital anomalies;
- Other open cardiac procedures;
- Heart transplants;
- Aorta or other non-cardiac arterial bypass procedures;
- Head, neck, intracranial vascular procedures; or,
- Other chest and thoracic procedures

This cohort is defined using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-09-CM) procedure codes and/or International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-Procedure Coding System [PCS]) procedure codes identified in Medicare Part A Inpatient claims data. To create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures see exclusion). ICD-09-CM and ICD-10-PCS procedure codes that indicate a patient

has undergone a non-isolated CABG procedure (CABG surgeries that occur concomitantly with procedures that elevate patients' mortality risk) and thus does not meet criteria for inclusion in the measure cohort are used to identify such patients for removal from the cohort.

The ICD-09-CM and ICD-10-PCS procedure codes are listed in the attached Data Dictionary.

EXCLUSIONS

The 90-day CABG surgery mortality measure excludes index admissions for patients:

1) With inconsistent or unknown vital status or other unreliable data.

2) Who leave the hospital against medical advice (AMA).

3) With qualifying CABG procedures subsequent to another qualifying CABG procedure during the measurement period.

EXCLUSION DETAILS

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 a 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

Statistical risk model

STRATIFICATION

N/A

TYPE SCORE

Rate/proportion better quality = lower score

ALGORITHM

The measure estimates hospital-level, 90-day, all-cause, RSMRs for CABG surgery using a hierarchical logistic regression model. 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 90 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 90 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 specific hospital's performance, given its case mix, to be compared to an average hospital's performance with the same case mix. Thus, a lower rate indicates lower-than-expected mortality rates or better quality, while a higher rate 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 90-day CABG mortality measure methodology report (YNHHS/CORE, 2018).

References

Normand S-LT, Shahian DM. 2007. Statistical and clinical aspects of hospital outcomes profiling. Statistical Science 22(2): 206-226.

Yale New Haven Health System/Center for Outcomes Research & Evaluation (YNHHS/CORE). Hospital-Level 90-day All-Cause Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery; Updated Measure Methodology Report. 2018.

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N/A

Appendix E1: Related and Competing Measures (tabular version)

Comparison of NQF 0456, NQF 0113, and NQF 0734

	0456 Participation in a Systematic National Database for General Thoracic Surgery	0113 Participation in a Systematic Database for Cardiac Surgery	0734 Participation in a National Database for Pediatric and Congenital Heart Surgery
Steward	The Society of Thoracic Surgeons	STS Quality Measurement Task Force. Roster available upon request.	The Society of Thoracic Surgeons
Description	Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.	Surgery : Cardiac Surgery, Surgery	Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.
Type	Structure	Participation in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data	Structure
Data Source	Registry Data STS General Thoracic Surgery Database – Version 2.2 Available at measure-specific web page URL identified in S.1 No data dictionary	Registry STS Adult Cardiac Surgery Database – Version 2.73; STS Adult Cardiac Surgery Database Version 2.8 will go live on July 1, 2014. Available at measure-specific web page URL identified in S.1 Does the facility participate in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data? (y/n) 12 months	Registry Data STS Congenital Heart Surgery Database Version 3.22 Available at measure-specific web page URL identified in S.1 No data dictionary
Level	Clinician : Group/Practice	Facility, Clinician : Group/Practice, Other	Clinician : Group/Practice, Other
Setting	Inpatient/Hospital	Hospital	Inpatient/Hospital
Numerator Statement	Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures	N/A	Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.
Numerator Details	Participation in the STS General Thoracic Surgery Database is initiated by the surgeons and or/hospital and requires semiannual submission via an approved software system to the Duke Clinical Research Institute (DCRI), the data repository for the three STS Databases. The General Thoracic Surgery Database accepts data from General Surgeons performing Thoracic procedures as well as Thoracic Surgeons.	N/A	Participation is defined as submission of all congenital and pediatric operations performed to the database.
Denominator Statement	N/A	No risk adjustment or risk stratification	N/A
Denominator Details	N/A		N/A
Exclusions	N/A	N/A	N/A
Exclusion Details	N/A		N/A
Risk Adjustment	No risk adjustment or risk stratification	Categorical	No risk adjustment or risk stratification
Stratification	N/A		N/A
Type Score	Categorical, e.g., yes/no passing score defines better quality	passing score defines better quality N/A No diagram provided	Categorical, e.g., yes/no passing score defines better quality
Algorithm	See S.4 - S.5	N/A	See S.4 - S.5
Submission items	5.1 Identified measures: 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures 0113 : Participation in a Systematic Database for Cardiac Surgery 0734 : Participation in a National Database for Pediatric and Congenital Heart Surgery 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0734 (both STS) are for different patient and surgical case populations 5b.1 If competing, why superior or rationale for additive value:	5.1 Identified measures: 5a.1 Are specs completely harmonized? 5a.2 If not completely harmonized, identify difference, rationale, impact: The Society of Thoracic Surgeons 5b.1 If competing, why superior or rationale for additive value: Mark | Antman | mantman@sts.org | 312-202-5856-	5.1 Identified measures: 0456 : Participation in a Systematic National Database for General Thoracic Surgery 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures 0113 : Participation in a Systematic Database for Cardiac Surgery 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0456 (both STS) are for different patient and surgical case populations 5b.1 If competing, why superior or rationale for additive value:

Comparison of NQF 2683 and NQF 0339

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
Steward	The Society of Thoracic Surgeons	Agency for Healthcare Research and Quality
Description	Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure	In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams. [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.]
Type	Outcome	Outcome
Data Source	Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014. Available at measure-specific web page URL identified in S.1 No data dictionary	Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions. URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx
Level	Clinician : Group/Practice	Facility
Setting	Inpatient/Hospital	Inpatient/Hospital
Numerator Statement	Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Numerator Details	Number of index pediatric and/or congenital heart surgery operations with an operative mortality; Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0): 1. Mortality status at database discharge (MtDBDisStat) 2. Status at 30 days after surgery (Mt30Stat)	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Denominator Statement	All patients undergoing index pediatric and/or congenital heart surgery	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).
Denominator Details	Number of index pediatric and/or congenital heart surgery operations. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations, please refer to the data collection form and data specifications documents which can be accessed using the URLs provided in S.1 above.	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D). ICD-9-CM Congenital heart disease procedure codes (1P)1: 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY 3505 ENDOVAS REPL AORTC VALVE 3506 TRNSAPCL REP AORTC VALVE 3507 ENDOVAS REPL PULM VALVE 3508 TRNSAPCL REPL PULM VALVE 3510 OPEN VALVULOPLASTY NOS 3511 OPN AORTIC VALVULOPLASTY 3512 OPN MITRAL VALVULOPLASTY 3513 OPN PULMON VALVULOPLASTY 3514 OPN TRICUS VALVULOPLASTY 3520 OPN/OTH REP HRT VLV NOS 3521 OPN/OTH REP AORT VLV-TIS 3522 OPN/OTH REP AORTIC VALVE 3523 OPN/OTH REP MTRL VLV-TIS 3524 OPN/OTH REP MITRAL VALVE 3525 OPN/OTH REP PULM VLV-TIS 3526 OPN/OTH REPL PUL VALVE 3527 OPN/OTH REP TCSPD VLV-TS 3528 OPN/OTH REPL TCSPD VALVE 3531 PAPILLARY MUSCLE OPS 3532 CHORDAE TENDINEAE OPS

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		3533 ANNULOPLASTY 3534 INFUNDIBULECTOMY 3535 TRABECUL CARNEAE CORD OP 3539 TISS ADJ TO VALV OPS NEC 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT 3550 PROSTH REP HRT SEPTA NOS 3551 PROS REP ATRIAL DEF-OPN 3552 PROS REPAIR ATRIA DEF-CL 3553 PROS REP VENTRIC DEF-OPN 3554 PROS REP ENDOCAR CUSHION 3560 GRFT REPAIR HRT SEPT NOS 3561 GRAFT REPAIR ATRIAL DEF 3562 GRAFT REPAIR VENTRIC DEF 3563 GRFT REP ENDOCAR CUSHION 3570 HEART SEPTA REPAIR NOS 3571 ATRIA SEPTA DEF REP NEC 3572 VENTR SEPTA DEF REP NEC 3573 ENDOCAR CUSHION REP NEC 3581 TOT REPAIR TETRAL FALLOT 3582 TOTAL REPAIR OF TAPVC 3583 TOT REP TRUNCUS ARTERIOS 3584 TOT COR TRANSPOS GRT VES 3591 INTERAT VEN RETRN TRANSP 3592 CONDUIT RT VENT-PUL ART 3593 CONDUIT LEFT VENTR-AORTA 3594 CONDUIT ARTIUM-PULM ART 3595 HEART REPAIR REVISION 3598 OTHER HEART SEPTA OPS 3599 OTHER HEART VALVE OPS 3699 HEART VESSEL OP NEC 3733 EXC/DEST HRT LESION OPEN 3736 EXC,DESTRCT,EXCLUS LAA 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 390 SYSTEMIC-PULM ART SHUNT 3921 CAVAL-PULMON ART ANASTOM 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Non-specific heart surgery procedure codes (2P): 3834 AORTA RESECTION & ANAST 3835 THOR VESSEL RESECT/ANAST 3844 RESECT ABDM AORTA W REPL 3845 RESECT THORAC VES W REPL 3864 EXCISION OF AORTA 3865 THORACIC VESSEL EXCISION 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3949 VASC PROC REVISION NEC 3956 REPAIR VESS W TIS PATCH 3957 REP VESS W SYNTH PATCH 3958 REPAIR VESS W PATCH NOS 3959 REPAIR OF VESSEL NEC ICD-9-CM Congenital heart disease diagnosis codes (2D)1: 7450 COMMON TRUNCUS 74510 COMPL TRANSPOS GREAT VES 74511 DOUBLE OUTLET RT VENTRIC 74512 CORRECT TRANSPOS GRT VES 74519 TRANSPOS GREAT VESS NEC 7452 TETRALOGY OF FALLOT 7453 COMMON VENTRICLE 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF 74560 ENDOCARD CUSHION DEF NOS 74561 OSTIUM PRIMUM DEFECT 74569 ENDOCARD CUSHION DEF NEC 7457 COR BILOCULARE 7458 SEPTAL CLOSURE ANOM NEC 7459 SEPTAL CLOSURE ANOM NOS 74600 PULMONARY VALVE ANOM NOS 74601 CONG PULMON VALV ATRESIA 74602 CONG PULMON VALVE STENOS 74609 PULMONARY VALVE ANOM NEC

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		7461 CONG TRICUSP ATRES/STEN 7462 EBSTEIN'S ANOMALY 7463 CONG AORTA VALV STENOSIS 7464 CONG AORTA VALV INSUFFIC 7465 CONGEN MITRAL STENOSIS 7466 CONG MITRAL INSUFFICIENC 7467 HYPOPLAS LEFT HEART SYND 74681 CONG SUBAORTIC STENOSIS 74682 COR TRIATRIATUM 74683 INFUNDIB PULMON STENOSIS 74684 OBSTRUCT HEART ANOM NEC 74685 CORONARY ARTERY ANOMALY 74687 MALPOSITION OF HEART 74689 CONG HEART ANOMALY NEC 7469 CONG HEART ANOMALY NOS 7470 PATENT DUCTUS ARTERIOSUS 74710 COARCTATION OF AORTA 74711 INTERRUPT OF AORTIC ARCH 74720 CONG ANOM OF AORTA NOS 74721 ANOMALIES OF AORTIC ARCH 74722 AORTIC ATRESIA/STENOSIS 74729 CONG ANOM OF AORTA NEC 7473 PULMONARY ARTERY ANOM 74731 PULMON ART COARCT/ATRES 74732 PULMONARY AV MALFORMATN 74739 OTH ANOM PUL ARTERY/CIRC 74740 GREAT VEIN ANOMALY NOS 74741 TOT ANOM PULM VEN CONNEC 74742 PART ANOM PULM VEN CONN 74749 GREAT VEIN ANOMALY NEC 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.
Exclusions	- Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure. - All operations where the primary procedure is either pectus repair or bronchoscopy are not classified as cardiac operations (i.e., they are thoracic procedures) and thus, they are excluded from the denominator	Exclude cases: • with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for heart transplant (7P) • with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA† • with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA† • age less than or equal to 30 days with PDA† • transferring to another short-term hospital (DISP=2) • neonates with birth weight less than 500 grams (Birth Weight Category 1) • MDC 14 (pregnancy, childbirth and pueperium) • with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		† PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code. See Pediatric Quality Indicators Appendices: • Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn • Appendix L- Low Birth Weight Categories
Exclusion Details	Weight in kilograms [WeightKg (STS Congenital Heart Surgery Database Version 3.0)] = 2.5 kg and primary procedure (PrimProc) is marked "1330 = PDA closure, Surgical"; primary procedure (PrimProc) is marked "1430 = Pectus repair" or "1870 = Bronchoscopy"	ICD-9-CM Closed heart valvotomy procedure codes (3AP): 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY ICD-9-CM Atrial septal enlargement procedure codes (3BP): 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT ICD-9-CM Atrial septal defect repair procedure codes (3CP): 3551 PROS REP ATRIAL DEF-OPN 3571 ATRIA SEPTA DEF REP NEC ICD-9-CM Ventricular septal defect repair procedure codes (3DP): 3553 PROS REP VENTRIC DEF-OPN 3572 VENTR SEPTA DEF REP NEC ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP): 3885 OCCLUDE THORACIC VES NEC ICD-9-CM PDA closure diagnosis code (3D): 7470 PATENT DUCTUS ARTERIOSUS ICD-9-CM Other surgical occlusion procedure codes (3FP): 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3959 REPAIR OF VESSEL NEC ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P): 3541 ENLARGE EXISTING SEP DEF 3552 PROS REPAIR ATRIA DEF-CL ICD-9-CM Extracorporeal circulation procedure code (5P): 3961 EXTRACORPOREAL CIRCULAT ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D): 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF ICD-9-CM Catheterization procedure codes (6P): 3721 RT HEART CARDIAC CATH 3722 LEFT HEART CARDIAC CATH 3723 RT/LEFT HEART CARD CATH 8842 CONTRAST AORTOGRAM 8843 CONTR PULMON ARTERIOGRAM 8844 CONTR THOR ARTERIOGR NEC 8850 ANGIOCARDIOGRAPHY NOS 8851 VENA CAV ANGIOCARDIOGRAM 8852 RT HEART ANGIOCARDIOGRAM 8853 LT HEART ANGIOCARDIOGRAM 8854 RT & LT HEART ANGIOCARD 8855 CORONAR ARTERIOGR-1 CATH 8856 CORONAR ARTERIOGR-2 CATH 8857 CORONARY ARTERIOGRAM NEC 8858 NEGATVE-CONTR CARDIOGRAM ICD-9-CM Heart transplant procedure codes (7P)1: 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Premature infant diagnosis codes (4D): 76500 EXTREME IMMATUR WTNOS 76501 EXTREME IMMATUR <500G 76502 EXTREME IMMATUR 500-749G 76503 EXTREME IMMATUR 750-999G 76504 EXTREME IMMAT 1000-1249G 76505 EXTREME IMMAT 1250-1499G 76506 EXTREME IMMAT 1500-1749G 76507 EXTREME IMMAT 1750-1999G 76508 EXTREME IMMAT 2000-2499G 76509 EXTREME IMMAT 2500+G

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		76510 PRETERM INFANT NEC WTNOS 76511 PRETERM NEC <500G 76512 PRETERM NEC 500-749G 76513 PRETERM NEC 750-999G 76514 PRETERM NEC 1000-1249G 76515 PRETERM NEC 1250-1499G 76516 PRETERM NEC 1500-1749G 76517 PRETERM NEC 1750-1999G 76518 PRETERM NEC 2000-2499G 76519 PRETERM NEC 2500+G
Risk Adjustment	Statistical risk model	Statistical risk model
Stratification	N/A	The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.
Type Score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score
Algorithm	Please refer to numerator and denominator sections for detailed information.	The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.
Submission items	5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06) 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measure is based on clinical registry data. 5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature – Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4]. First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between data sources for half of the benchmark operations. The negative predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was	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: No competing measures found. Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

	2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
	lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p = 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment. Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9: • accidental miscoding • coding performed by medical records clerks who have never seen the actual patient • contradictory or poorly described information in the medical record • lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9 • inadequately trained medical coders. Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.) References 1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603. 2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. J Perinatol 2005;25:737-42. 3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100. 4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.	

Comparison of NQF 0732 and NQF 0339

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
Steward	The Society of Thoracic Surgeons	Agency for Healthcare Research and Quality
Description	Surgical volume for pediatric and congenital heart surgery: total programmatic volume and programmatic volume stratified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool	In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams. [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.]
Type	Structure	Outcome
Data Source	Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014. Available at measure-specific web page URL identified in S.1 No data dictionary	Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions. URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx
Level	Clinician : Group/Practice	Facility
Setting	Inpatient/Hospital	Inpatient/Hospital
Numerator Statement	1) Total number of pediatric and congenital cardiac surgery operations and 2) number of pediatric and congenital cardiac surgery operations in each of the strata of complexity specified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Numerator Details	Please see Appendix.	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Denominator Statement	N/A	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).
Denominator Details	N/A	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D). ICD-9-CM Congenital heart disease procedure codes (1P)1: 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY 3505 ENDOVAS REPL AORTC VALVE 3506 TRNSAPCL REP AORTC VALVE 3507 ENDOVAS REPL PULM VALVE 3508 TRNSAPCL REPL PULM VALVE 3510 OPEN VALVULOPLASTY NOS 3511 OPN AORTIC VALVULOPLASTY 3512 OPN MITRAL VALVULOPLASTY 3513 OPN PULMON VALVULOPLASTY 3514 OPN TRICUS VALVULOPLASTY 3520 OPN/OTH REP HRT VLV NOS 3521 OPN/OTH REP AORT VLV-TIS 3522 OPN/OTH REP AORTIC VALVE 3523 OPN/OTH REP MTRL VLV-TIS 3524 OPN/OTH REP MITRAL VALVE 3525 OPN/OTH REP PULM VLV-TIS 3526 OPN/OTH REPL PUL VALVE 3527 OPN/OTH REP TCSPD VLV-TS 3528 OPN/OTH REPL TCSPD VALVE 3531 PAPILLARY MUSCLE OPS 3532 CHORDAE TENDINEAE OPS 3533 ANNULOPLASTY 3534 INFUNDIBULECTOMY 3535 TRABECUL CARNEAE CORD OP

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		3539 TISS ADJ TO VALV OPS NEC 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT 3550 PROSTH REP HRT SEPTA NOS 3551 PROS REP ATRIAL DEF-OPN 3552 PROS REPAIR ATRIA DEF-CL 3553 PROS REP VENTRIC DEF-OPN 3554 PROS REP ENDOCAR CUSHION 3560 GRFT REPAIR HRT SEPT NOS 3561 GRAFT REPAIR ATRIAL DEF 3562 GRAFT REPAIR VENTRIC DEF 3563 GRFT REP ENDOCAR CUSHION 3570 HEART SEPTA REPAIR NOS 3571 ATRIA SEPTA DEF REP NEC 3572 VENTR SEPTA DEF REP NEC 3573 ENDOCAR CUSHION REP NEC 3581 TOT REPAIR TETRAL FALLOT 3582 TOTAL REPAIR OF TAPVC 3583 TOT REP TRUNCUS ARTERIOS 3584 TOT COR TRANSPOS GRT VES 3591 INTERAT VEN RETRN TRANSP 3592 CONDUIT RT VENT-PUL ART 3593 CONDUIT LEFT VENTR-AORTA 3594 CONDUIT ARTIUM-PULM ART 3595 HEART REPAIR REVISION 3598 OTHER HEART SEPTA OPS 3599 OTHER HEART VALVE OPS 3699 HEART VESSEL OP NEC 3733 EXC/DEST HRT LESION OPEN 3736 EXC,DESTRCT,EXCLUS LAA 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 390 SYSTEMIC-PULM ART SHUNT 3921 CAVAL-PULMON ART ANASTOM 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Non-specific heart surgery procedure codes (2P): 3834 AORTA RESECTION & ANAST 3835 THOR VESSEL RESECT/ANAST 3844 RESECT ABDM AORTA W REPL 3845 RESECT THORAC VES W REPL 3864 EXCISION OF AORTA 3865 THORACIC VESSEL EXCISION 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3949 VASC PROC REVISION NEC 3956 REPAIR VESS W TIS PATCH 3957 REP VESS W SYNTH PATCH 3958 REPAIR VESS W PATCH NOS 3959 REPAIR OF VESSEL NEC ICD-9-CM Congenital heart disease diagnosis codes (2D)1: 7450 COMMON TRUNCUS 74510 COMPL TRANSPOS GREAT VES 74511 DOUBLE OUTLET RT VENTRIC 74512 CORRECT TRANSPOS GRT VES 74519 TRANSPOS GREAT VESS NEC 7452 TETRALOGY OF FALLOT 7453 COMMON VENTRICLE 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF 74560 ENDOCARD CUSHION DEF NOS 74561 OSTIUM PRIMUM DEFECT 74569 ENDOCARD CUSHION DEF NEC 7457 COR BILOCULARE 7458 SEPTAL CLOSURE ANOM NEC 7459 SEPTAL CLOSURE ANOM NOS 74600 PULMONARY VALVE ANOM NOS 74601 CONG PULMON VALV ATRESIA 74602 CONG PULMON VALVE STENOS 74609 PULMONARY VALVE ANOM NEC 7461 CONG TRICUSP ATRES/STEN 7462 EBSTEIN'S ANOMALY

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		7463 CONG AORTA VALV STENOSIS 7464 CONG AORTA VALV INSUFFIC 7465 CONGEN MITRAL STENOSIS 7466 CONG MITRAL INSUFFICIENC 7467 HYPOPLAS LEFT HEART SYND 74681 CONG SUBAORTIC STENOSIS 74682 COR TRIATRIATUM 74683 INFUNDIB PULMON STENOSIS 74684 OBSTRUCT HEART ANOM NEC 74685 CORONARY ARTERY ANOMALY 74687 MALPOSITION OF HEART 74689 CONG HEART ANOMALY NEC 7469 CONG HEART ANOMALY NOS 7470 PATENT DUCTUS ARTERIOSUS 74710 COARCTATION OF AORTA 74711 INTERRUPT OF AORTIC ARCH 74720 CONG ANOM OF AORTA NOS 74721 ANOMALIES OF AORTIC ARCH 74722 AORTIC ATRESIA/STENOSIS 74729 CONG ANOM OF AORTA NEC 7473 PULMONARY ARTERY ANOM 74731 PULMON ART COARCT/ATRES 74732 PULMONARY AV MALFORMATN 74739 OTH ANOM PUL ARTERY/CIRC 74740 GREAT VEIN ANOMALY NOS 74741 TOT ANOM PULM VEN CONNEC 74742 PART ANOM PULM VEN CONN 74749 GREAT VEIN ANOMALY NEC 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.
Exclusions	N/A	Exclude cases: • with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for heart transplant (7P) • with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA† • with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA† • age less than or equal to 30 days with PDA† • transferring to another short-term hospital (DISP=2) • neonates with birth weight less than 500 grams (Birth Weight Category 1) • MDC 14 (pregnancy, childbirth and pueperium) • with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		† PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code. See Pediatric Quality Indicators Appendices: • Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn • Appendix L- Low Birth Weight Categories
Exclusion Details	N/A	ICD-9-CM Closed heart valvotomy procedure codes (3AP): 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY ICD-9-CM Atrial septal enlargement procedure codes (3BP): 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT ICD-9-CM Atrial septal defect repair procedure codes (3CP): 3551 PROS REP ATRIAL DEF-OPN 3571 ATRIA SEPTA DEF REP NEC ICD-9-CM Ventricular septal defect repair procedure codes (3DP): 3553 PROS REP VENTRIC DEF-OPN 3572 VENTR SEPTA DEF REP NEC ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP): 3885 OCCLUDE THORACIC VES NEC ICD-9-CM PDA closure diagnosis code (3D): 7470 PATENT DUCTUS ARTERIOSUS ICD-9-CM Other surgical occlusion procedure codes (3FP): 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3959 REPAIR OF VESSEL NEC ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P): 3541 ENLARGE EXISTING SEP DEF 3552 PROS REPAIR ATRIA DEF-CL ICD-9-CM Extracorporeal circulation procedure code (5P): 3961 EXTRACORPOREAL CIRCULAT ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D): 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF ICD-9-CM Catheterization procedure codes (6P): 3721 RT HEART CARDIAC CATH 3722 LEFT HEART CARDIAC CATH 3723 RT/LEFT HEART CARD CATH 8842 CONTRAST AORTOGRAM 8843 CONTR PULMON ARTERIOGRAM 8844 CONTR THOR ARTERIOGR NEC 8850 ANGIOCARDIOGRAPHY NOS 8851 VENA CAV ANGIOCARDIOGRAM 8852 RT HEART ANGIOCARDIOGRAM 8853 LT HEART ANGIOCARDIOGRAM 8854 RT & LT HEART ANGIOCARD 8855 CORONAR ARTERIOGR-1 CATH 8856 CORONAR ARTERIOGR-2 CATH 8857 CORONARY ARTERIOGRAM NEC 8858 NEGATVE-CONTR CARDIOGRAM ICD-9-CM Heart transplant procedure codes (7P)1: 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Premature infant diagnosis codes (4D): 76500 EXTREME IMMATUR WTNOS 76501 EXTREME IMMATUR <500G 76502 EXTREME IMMATUR 500-749G 76503 EXTREME IMMATUR 750-999G 76504 EXTREME IMMAT 1000-1249G 76505 EXTREME IMMAT 1250-1499G 76506 EXTREME IMMAT 1500-1749G 76507 EXTREME IMMAT 1750-1999G 76508 EXTREME IMMAT 2000-2499G

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		76509 EXTREME IMMAT 2500+G 76510 PRETERM INFANT NEC WTNOS 76511 PRETERM NEC <500G 76512 PRETERM NEC 500-749G 76513 PRETERM NEC 750-999G 76514 PRETERM NEC 1000-1249G 76515 PRETERM NEC 1250-1499G 76516 PRETERM NEC 1500-1749G 76517 PRETERM NEC 1750-1999G 76518 PRETERM NEC 2000-2499G 76519 PRETERM NEC 2500+G
Risk Adjustment	Stratification by risk category/subgroup	Statistical risk model
Stratification	Please see Appendix	The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.
Type Score	Count better quality = higher score	Rate/proportion better quality = lower score
Algorithm	Please refer to numerator section and Appendix for detailed information.	The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.
Submission items	5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06) 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measures are based on clinical registry data. 5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature – Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4]. First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between data sources for half of the benchmark operations. The negative	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: No competing measures found. Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

	0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
	predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p = 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment. Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9: • accidental miscoding • coding performed by medical records clerks who have never seen the actual patient • contradictory or poorly described information in the medical record • lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9 • inadequately trained medical coders. Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.) References 1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603. 2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. J Perinatol 2005;25:737-42. 3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100. 4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.	

Comparison of NQF 0733 and NQF 0339

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
Steward	The Society of Thoracic Surgeons	Agency for Healthcare Research and Quality
Description	Percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Categories, a multi-institutional validated risk stratification tool	In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams. [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.]
Type	Outcome	Outcome
Data Source	Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014. Available at measure-specific web page URL identified in S.1 No data dictionary	Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions. URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx
Level	Clinician : Group/Practice	Facility
Setting	Inpatient/Hospital	Inpatient/Hospital
Numerator Statement	Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Levels, a multi-institutional validated complexity stratification tool	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Numerator Details	Number of index pediatric and/or congenital heart surgery operations with an operative mortality; Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0): 1. Mortality status at database discharge (MtDBDisStat) 2. Status at 30 days after surgery (Mt30Stat)	Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.
Denominator Statement	All patients undergoing index pediatric and/or congenital heart surgery	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).
Denominator Details	Number of index cardiac operations in each level of complexity stratification using the 5 STAT Mortality Categories, a multi-institutional validated complexity stratification tool. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations and their respective STAT category, please see the Appendix.	Discharges, for patients ages 17 years and younger, with either • any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or • any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D). ICD-9-CM Congenital heart disease procedure codes (1P)1: 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY 3505 ENDOVAS REPL AORTC VALVE 3506 TRNSAPCL REP AORTC VALVE 3507 ENDOVAS REPL PULM VALVE 3508 TRNSAPCL REPL PULM VALVE 3510 OPEN VALVULOPLASTY NOS 3511 OPN AORTIC VALVULOPLASTY 3512 OPN MITRAL VALVULOPLASTY 3513 OPN PULMON VALVULOPLASTY 3514 OPN TRICUS VALVULOPLASTY 3520 OPN/OTH REP HRT VLV NOS 3521 OPN/OTH REP AORT VLV-TIS 3522 OPN/OTH REP AORTIC VALVE 3523 OPN/OTH REP MTRL VLV-TIS 3524 OPN/OTH REP MITRAL VALVE 3525 OPN/OTH REP PULM VLV-TIS 3526 OPN/OTH REPL PUL VALVE 3527 OPN/OTH REP TCSPD VLV-TS 3528 OPN/OTH REPL TCSPD VALVE

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		3531 PAPILLARY MUSCLE OPS 3532 CHORDAE TENDINEAE OPS 3533 ANNULOPLASTY 3534 INFUNDIBULECTOMY 3535 TRABECUL CARNEAE CORD OP 3539 TISS ADJ TO VALV OPS NEC 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT 3550 PROSTH REP HRT SEPTA NOS 3551 PROS REP ATRIAL DEF-OPN 3552 PROS REPAIR ATRIA DEF-CL 3553 PROS REP VENTRIC DEF-OPN 3554 PROS REP ENDOCAR CUSHION 3560 GRFT REPAIR HRT SEPT NOS 3561 GRAFT REPAIR ATRIAL DEF 3562 GRAFT REPAIR VENTRIC DEF 3563 GRFT REP ENDOCAR CUSHION 3570 HEART SEPTA REPAIR NOS 3571 ATRIA SEPTA DEF REP NEC 3572 VENTR SEPTA DEF REP NEC 3573 ENDOCAR CUSHION REP NEC 3581 TOT REPAIR TETRAL FALLOT 3582 TOTAL REPAIR OF TAPVC 3583 TOT REP TRUNCUS ARTERIOS 3584 TOT COR TRANSPOS GRT VES 3591 INTERAT VEN RETRN TRANSP 3592 CONDUIT RT VENT-PUL ART 3593 CONDUIT LEFT VENTR-AORTA 3594 CONDUIT ARTIUM-PULM ART 3595 HEART REPAIR REVISION 3598 OTHER HEART SEPTA OPS 3599 OTHER HEART VALVE OPS 3699 HEART VESSEL OP NEC 3733 EXC/DEST HRT LESION OPEN 3736 EXC,DESTRCT,EXCLUS LAA 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 390 SYSTEMIC-PULM ART SHUNT 3921 CAVAL-PULMON ART ANASTOM 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Non-specific heart surgery procedure codes (2P): 3834 AORTA RESECTION & ANAST 3835 THOR VESSEL RESECT/ANAST 3844 RESECT ABDM AORTA W REPL 3845 RESECT THORAC VES W REPL 3864 EXCISION OF AORTA 3865 THORACIC VESSEL EXCISION 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3949 VASC PROC REVISION NEC 3956 REPAIR VESS W TIS PATCH 3957 REP VESS W SYNTH PATCH 3958 REPAIR VESS W PATCH NOS 3959 REPAIR OF VESSEL NEC ICD-9-CM Congenital heart disease diagnosis codes (2D)1: 7450 COMMON TRUNCUS 74510 COMPL TRANSPOS GREAT VES 74511 DOUBLE OUTLET RT VENTRIC 74512 CORRECT TRANSPOS GRT VES 74519 TRANSPOS GREAT VESS NEC 7452 TETRALOGY OF FALLOT 7453 COMMON VENTRICLE 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF 74560 ENDOCARD CUSHION DEF NOS 74561 OSTIUM PRIMUM DEFECT 74569 ENDOCARD CUSHION DEF NEC 7457 COR BILOCULARE 7458 SEPTAL CLOSURE ANOM NEC 7459 SEPTAL CLOSURE ANOM NOS 74600 PULMONARY VALVE ANOM NOS 74601 CONG PULMON VALV ATRESIA

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		74602 CONG PULMON VALVE STENOS 74609 PULMONARY VALVE ANOM NEC 7461 CONG TRICUSP ATRES/STEN 7462 EBSTEIN'S ANOMALY 7463 CONG AORTA VALV STENOSIS 7464 CONG AORTA VALV INSUFFIC 7465 CONGEN MITRAL STENOSIS 7466 CONG MITRAL INSUFFICIENC 7467 HYPOPLAS LEFT HEART SYND 74681 CONG SUBAORTIC STENOSIS 74682 COR TRIATRIATUM 74683 INFUNDIB PULMON STENOSIS 74684 OBSTRUCT HEART ANOM NEC 74685 CORONARY ARTERY ANOMALY 74687 MALPOSITION OF HEART 74689 CONG HEART ANOMALY NEC 7469 CONG HEART ANOMALY NOS 7470 PATENT DUCTUS ARTERIOSUS 74710 COARCTATION OF AORTA 74711 INTERRUPT OF AORTIC ARCH 74720 CONG ANOM OF AORTA NOS 74721 ANOMALIES OF AORTIC ARCH 74722 AORTIC ATRESIA/STENOSIS 74729 CONG ANOM OF AORTA NEC 7473 PULMONARY ARTERY ANOM 74731 PULMON ART COARCT/ATRES 74732 PULMONARY AV MALFORMATN 74739 OTH ANOM PUL ARTERY/CIRC 74740 GREAT VEIN ANOMALY NOS 74741 TOT ANOM PULM VEN CONNEC 74742 PART ANOM PULM VEN CONN 74749 GREAT VEIN ANOMALY NEC 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.
Exclusions	N/A	Exclude cases: • with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P) • with any-listed ICD-9-CM procedure codes for heart transplant (7P) • with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA† • with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA† • age less than or equal to 30 days with PDA† • transferring to another short-term hospital (DISP=2) • neonates with birth weight less than 500 grams (Birth Weight Category 1) • MDC 14 (pregnancy, childbirth and pueperium)

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing) † PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code. See Pediatric Quality Indicators Appendices: • Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn • Appendix L- Low Birth Weight Categories
Exclusion Details	N/A	ICD-9-CM Closed heart valvotomy procedure codes (3AP): 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY ICD-9-CM Atrial septal enlargement procedure codes (3BP): 3541 ENLARGE EXISTING SEP DEF 3542 CREATE SEPTAL DEFECT ICD-9-CM Atrial septal defect repair procedure codes (3CP): 3551 PROS REP ATRIAL DEF-OPN 3571 ATRIA SEPTA DEF REP NEC ICD-9-CM Ventricular septal defect repair procedure codes (3DP): 3553 PROS REP VENTRIC DEF-OPN 3572 VENTR SEPTA DEF REP NEC ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP): 3885 OCCLUDE THORACIC VES NEC ICD-9-CM PDA closure diagnosis code (3D): 7470 PATENT DUCTUS ARTERIOSUS ICD-9-CM Other surgical occlusion procedure codes (3FP): 3884 OCCLUDE AORTA NEC 3885 OCCLUDE THORACIC VES NEC 3959 REPAIR OF VESSEL NEC ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P): 3541 ENLARGE EXISTING SEP DEF 3552 PROS REPAIR ATRIA DEF-CL ICD-9-CM Extracorporeal circulation procedure code (5P): 3961 EXTRACORPOREAL CIRCULAT ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D): 7454 VENTRICULAR SEPT DEFECT 7455 SECUNDUM ATRIAL SEPT DEF ICD-9-CM Catheterization procedure codes (6P): 3721 RT HEART CARDIAC CATH 3722 LEFT HEART CARDIAC CATH 3723 RT/LEFT HEART CARD CATH 8842 CONTRAST AORTOGRAM 8843 CONTR PULMON ARTERIOGRAM 8844 CONTR THOR ARTERIOGR NEC 8850 ANGIOCARDIOGRAPHY NOS 8851 VENA CAV ANGIOCARDIOGRAM 8852 RT HEART ANGIOCARDIOGRAM 8853 LT HEART ANGIOCARDIOGRAM 8854 RT & LT HEART ANGIOCARD 8855 CORONAR ARTERIOGR-1 CATH 8856 CORONAR ARTERIOGR-2 CATH 8857 CORONARY ARTERIOGRAM NEC 8858 NEGATVE-CONTR CARDIOGRAM ICD-9-CM Heart transplant procedure codes (7P)1: 375 HEART TRANSPLANTATION 3751 HEART TRANSPLANTATION 3752 IMP TOT INT BI HT RP SYS 1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013. ICD-9-CM Premature infant diagnosis codes (4D): 76500 EXTREME IMMATUR WTNOS 76501 EXTREME IMMATUR <500G 76502 EXTREME IMMATUR 500-749G 76503 EXTREME IMMATUR 750-999G 76504 EXTREME IMMAT 1000-1249G 76505 EXTREME IMMAT 1250-1499G 76506 EXTREME IMMAT 1500-1749G

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
		76507 EXTREME IMMAT 1750-1999G 76508 EXTREME IMMAT 2000-2499G 76509 EXTREME IMMAT 2500+G 76510 PRETERM INFANT NEC WTNOS 76511 PRETERM NEC <500G 76512 PRETERM NEC 500-749G 76513 PRETERM NEC 750-999G 76514 PRETERM NEC 1000-1249G 76515 PRETERM NEC 1250-1499G 76516 PRETERM NEC 1500-1749G 76517 PRETERM NEC 1750-1999G 76518 PRETERM NEC 2000-2499G 76519 PRETERM NEC 2500+G
Risk Adjustment	Stratification by risk category/subgroup	Statistical risk model
Stratification	Please see Appendix	The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.
Type Score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score
Algorithm	Please refer to numerator and denominator sections as well as the attachments for detailed information.	The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.
Submission items	5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06) 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measure is based on clinical registry data. 5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature – Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4]. First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between	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: No competing measures found. Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

	0733 Operative Mortality Stratified by the 5 STAT Mortality Categories	0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)
	data sources for half of the benchmark operations. The negative predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p = 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment. Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9: • accidental miscoding • coding performed by medical records clerks who have never seen the actual patient • contradictory or poorly described information in the medical record • lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9 • inadequately trained medical coders. Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.) References 1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603. 2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. J Perinatol 2005;25:737-42. 3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100. 4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.	

Comparison of NQF 0734, NQF 0113, and NQF 0456

	0734 Participation in a National Database for Pediatric and Congenital Heart Surgery	0113 Participation in a Systematic Database for Cardiac Surgery	0456 Participation in a Systematic National Database for General Thoracic Surgery
Steward	The Society of Thoracic Surgeons	STS Quality Measurement Task Force. Roster available upon request.	The Society of Thoracic Surgeons
Description	Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.	Surgery : Cardiac Surgery, Surgery	Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.
Type	Structure	Participation in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data	Structure
Data Source	Registry Data STS Congenital Heart Surgery Database Version 3.22 Available at measure-specific web page URL identified in S.1 No data dictionary	Registry STS Adult Cardiac Surgery Database – Version 2.73; STS Adult Cardiac Surgery Database Version 2.8 will go live on July 1, 2014. Available at measure-specific web page URL identified in S.1 Does the facility participate in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data? (y/n) 12 months	Registry Data STS General Thoracic Surgery Database – Version 2.2 Available at measure-specific web page URL identified in S.1 No data dictionary
Level	Clinician : Group/Practice, Other	Facility, Clinician : Group/Practice, Other	Clinician : Group/Practice
Setting	Inpatient/Hospital	Hospital	Inpatient/Hospital
Numerator Statement	Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.	N/A	Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures
Numerator Details	Participation is defined as submission of all congenital and pediatric operations performed to the database.	N/A	Participation in the STS General Thoracic Surgery Database is initiated by the surgeons and or/hospital and requires semiannual submission via an approved software system to the Duke Clinical Research Institute (DCRI), the data repository for the three STS Databases. The General Thoracic Surgery Database accepts data from General Surgeons performing Thoracic procedures as well as Thoracic Surgeons.
Denominator Statement	N/A	No risk adjustment or risk stratification	N/A
Denominator Details	N/A		N/A
Exclusions	N/A	N/A	N/A
Exclusion Details	N/A		N/A
Risk Adjustment	No risk adjustment or risk stratification	Categorical	No risk adjustment or risk stratification
Stratification	N/A		N/A
Type Score	Categorical, e.g., yes/no passing score defines better quality	passing score defines better quality N/A No diagram provided	Categorical, e.g., yes/no passing score defines better quality
Algorithm	See S.4 - S.5	N/A	See S.4 - S.5
Submission items	5.1 Identified measures: 0456 : Participation in a Systematic National Database for General Thoracic Surgery 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures 0113 : Participation in a Systematic Database for Cardiac Surgery 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0456 (both STS) are for different patient and surgical case populations 5b.1 If competing, why superior or rationale for additive value:	5.1 Identified measures: 5a.1 Are specs completely harmonized? 5a.2 If not completely harmonized, identify difference, rationale, impact: The Society of Thoracic Surgeons 5b.1 If competing, why superior or rationale for additive value: Mark | Antman | mantman@sts.org | 312-202-5856-	5.1 Identified measures: 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures 0113 : Participation in a Systematic Database for Cardiac Surgery 0734 : Participation in a National Database for Pediatric and Congenital Heart Surgery 5a.1 Are specs completely harmonized? No 5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0734 (both STS) are for different patient and surgical case populations 5b.1 If competing, why superior or rationale for additive value:

Comparison of NQF 3493, NQF 1550, and NQF 1551

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
Steward	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services	Centers for Medicare & Medicaid Services
Description	This measure is a re-specified version of the measure, "Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)" (NQF 1550), which was developed for patients 65 years and older using Medicare claims data. This re-specified measure attributes outcomes to MIPS participating Eligible Clinicians and/or Eligible Clinician Groups ("providers"), rather than to hospitals, and assesses each provider's complication rate, 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 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.	This measure estimates a hospital-level, 30-day RSRR following elective primary THA and/or TKA. The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission. A specified set of planned readmissions do not count as readmissions. 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.
Type	Outcome	Outcome	Outcome
Data Source	Claims, Enrollment Data Medicare administrative claims and enrollment data No data collection instrument provided Attachment Del18eHOP5MIPSHKCDataDictionary121718-636824515108939830.xlsx	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.	Claims, Other, Paper Medical Records Data sources: The currently publically reported measure is specified and has been testing 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). 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: 3. California Patient Discharge Data in addition to CMS Medicare FFS data for patients in California hospitals. Using all-payer data from California, we performed analyses to determine whether the THA/TKA readmission 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 the analysis of the impact of SES variables on the measure's risk model. Note that the variables derived from these data are not included in the measure as specified 4. 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:

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
		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	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. Dorsey K, Grady J, Desai N, et al. 2016 Procedure-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Readmission Measures: Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) & Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) (Version 5.0). 2016 No data collection instrument provided Attachment NQF_1551_HKR__Data_Dictionary_v0.1_Final-636564636360815509.xls
Level	Clinician : Group/Practice, Clinician : Individual	Facility	Facility
Setting	Inpatient/Hospital, Outpatient Services	Inpatient/Hospital	Inpatient/Hospital, Other Hospital: Acute Care Facility
Numerator Statement	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 other than mortality are counted in the measure only if they occur during the index hospital admission or during a readmission. This outcome is identical to that of the original hospital measure. Additional details are provided in S.5 Numerator Details.	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 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 of the index hospitalization. If a patient has more than one unplanned admissions (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.
Numerator Details	Outcome Definition The composite complication is a dichotomous outcome (yes for any complication(s); no for no complications) occurring within 90 days post-date of the index admission. Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes." The measure includes the following surgical complications: surgical site bleeding, mechanical complications, periprosthetic joint infection/wound infection; and also includes death as a complication. The measure also includes the following medical complications, as they are important in measuring overall quality: acute myocardial infarction (AMI), pneumonia, pulmonary embolism, and sepsis/septicemia/shock. 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. This outcome definition is identical to the Hospital-level RSCR following elective primary THA and/or TKA” (NQF 1550). The measure assesses a dichotomous yes or no outcome of whether each admitted patient experiences one or more of the complications defined below. Complications other than mortality are counted in the measure only if they occur during the index admission or require a readmission. The measure does not count complications that occur in the outpatient	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	Outcome Definition The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of discharge of the index THA and/or TKA hospitalization, 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 (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

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
	setting and do not require a readmission. The outcome is aligned with CMS's hospital-level THA/TKA complication measure. The measure defines a "complication" as: • Acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia/shock during the index admission or a subsequent inpatient admission that occurs within 7 days from the start of the index admission; • Surgical site bleeding or pulmonary embolism during the index admission or a subsequent inpatient admission within 30 days from the start of the index admission; • Death during the index admission or within 30 days from the start of the index admission; • Mechanical complication or periprosthetic joint infection/wound infection during the index admission or a subsequent inpatient admission that occurs within 90 days from the start of the index admission. (See attached Data Dictionary for list of ICD-9 and 10 codes used to define complications). 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. For the full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheets HK Complications I10-Outcome" and "Complication Codes ICD9."	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".	readmission measures. In applying the algorithm to condition- and procedure-specific measures, teams of clinical experts reviewed the algorithm in the context of each measure-specific patient cohort and, where clinically indicated, adapted the content of the algorithm to better reflect the likely clinical experience of each measure's patient cohort. For the THA/TKA readmission measure, CMS used the Planned Readmission Algorithm without making any changes. For more details on the Planned Readmission Algorithm, please see the report titled "2017 Procedure-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Readmission Measures, Version 6.0" posted in the webpage provided in data field S.1.
Denominator Statement	The target population for the measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age who have undergone elective primary THA and/or TKA procedures. Attribution of Index Admissions to Eligible Clinicians Each patient index admission (the admission during which the patient has the eligible THA/TKA procedure), and therefore their outcome (complication or no complication) is attributed to the Eligible Clinician who bills for the procedure (Billing Surgeon). Conceptually, the Billing Surgeon is the Clinician with the primary responsibility for the procedure and procedure related care. In practice, patients may have different claims for the same procedure, and so the billing surgeon is assigned through an algorithm that resolves ambiguities in billing. The algorithm uses billing claims to identify the clinician(s) who bills for a THA (CPT® code 27130) or TKA (CPT®® code 27447 or CPT® code 27446) (steps 1-3 below). These CPT® codes are representative of the THA and/or TKA procedures included in the measure cohort. 1. If only one clinician bills for a THA (CPT® code 27130) or TKA (CPT® code 27446 or 27447) for a patient, the algorithm identifies and assigns this individual as the Billing Surgeon.	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.	The target population for the publicly 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.7 Denominator Details.

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
	2. If two or more clinicians bill for THA/TKA procedures (CPT® 27130, 27447, or 27446), the algorithm seeks to identify a 'key' physician among them. The algorithm identifies and excludes assignment to clinicians who were assistants-at-surgery (assistant surgeon with CPT® modifier 80 or 82, minimum assistant surgeon with CPT® modifier 81). In this step, the algorithm assigns the Billing Surgeon as the clinician who billed for a THA or TKA procedure and is not an assistant-at-surgery. 3. If a single clinician who is not an assistant-at-surgery could not be identified for assignment, then the algorithm identifies whether there is a single clinician who was an orthopedic surgeon (Medicare Specialty Code 20) and assigns this as the Billing Surgeon. 4. If the algorithm cannot identify a Billing Surgeon, it identifies whether an Operator is listed on the institutional claim. The algorithm then defaults assignment to the Operator listed on the institutional claim. Finally, if a Billing Surgeon or Operator cannot be identified with the steps above, the patient is not assigned to a clinician or group and is excluded from the measure. Attribution of Index Admissions to an Eligible Clinician Group CMS needs the flexibility to assign each eligible patient index admission to at least one Eligible Clinician and at least one Eligible Clinician group. This allows them the ability to report at either the Eligible Clinician or the Eligible Clinician Group level. Conceptually, these assignments should represent a consistent group of clinicians. That is, it would be confusing to assign a patient to Eligible Clinician A and also to Eligible Clinician Group B if Eligible Clinician A is not in that Group. The attribution methodology addresses this by using both individual and group identifiers. Every Medicare Eligible Clinician has a unique National Provider Identifier (NPI). Similarly, every Medicare Eligible Clinician Group has one or more Tax Identification Numbers (TINs), reflecting their practice setting(s). Each Eligible Clinician claim should include both their NPI and a TIN which identifies their "group" (which may consist only of that clinician if they are solo providers). Therefore, we identify clinicians for each patient index admission through the unique National Provider ID (NPI) and Tax ID (TIN) combination listed on a patient's claim. For a Billing Surgeon, the NPI and TIN are those on the procedure claim used to attribute the patient index admission. To identify the unique TIN/NPI combination for the Operator, the Operator's NPI is matched to the TIN with the most Part B allowed charges during the index admission or during the measurement year if the Operator did not bill during the index admission. Most NPIs are associated with only one TIN. A Clinician Group is set of Clinicians (NPI-TIN combinations) assigned to the same TIN. Additional details are provided in S.7 Denominator Details.		
Denominator Details	To be included in the measure cohort used, 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 and for 90 days after discharge;	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	To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria: 1. Enrolled in Medicare FFS Part A and Part B Medicare for the 12 months prior to the date of admission; and enrolled in Part A during the index admission;

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
	2. Aged 65 or older; and 3. Having a qualifying elective primary THA/TKA procedure. Elective primary THA/TKA procedures are defined as those procedures without any of the following: 1. Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission 2. 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 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 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. Elective primary THA/TKA procedures are defined as those procedures without any of the 8 associated conditions or finding noted above. For a full list of ICD-9 and ICD-10 codes defining the following see attached Data Dictionary, sheets “I-10 Cohort Codes” and “I9 Cohort Codes.” Additional details are provided in S.9 Denominator Details.	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: 0SR90J9 Replacement of Right Hip Joint with Synthetic Substitute, Cemented, Open Approach 0SR90JA Replacement of Right Hip Joint with Synthetic Substitute, Uncemented, Open Approach 0SR90JZ Replacement of Right Hip Joint with Synthetic Substitute, Open Approach 0SRB0J9 Replacement of Left Hip Joint with Synthetic Substitute, Cemented, Open Approach 0SRB0JA Replacement of Left Hip Joint with Synthetic Substitute, Uncemented, Open Approach 0SRB0JZReplacement of Left Hip Joint with Synthetic Substitute, Open Approach 0SRC07Z Replacement of Right Knee Joint with Autologous Tissue Substitute, Open Approach 0SRC0JZReplacement of Right Knee Joint with Synthetic Substitute, Open Approach 0SRC0KZ Replacement of Right Knee Joint with Nonautologous Tissue Substitute, Open Approach 0SRD07Z Replacement of Left Knee Joint with Autologous Tissue Substitute, Open Approach 0SRD0JZ Replacement of Left Knee Joint with Synthetic Substitute, Open Approach	2. Aged 65 or over; 3. Discharged alive from a non-federal acute care hospital; and, 4. Have a qualifying elective primary THA/TKA procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following: o Fracture of the pelvis or lower limbs coded in the principal or secondary discharge diagnosis fields of the index admission; o A concurrent partial hip arthroplasty procedure; o A concurrent revision, resurfacing, or implanted device/prosthesis removal procedure; o Mechanical complication coded in the principal discharge diagnosis field; o 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; or, o Transfer from another acute care facility for the THA/TKA ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

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		0SRD0KZReplacement of Left Knee Joint with Nonautologous Tissue Substitute, Open Approach 0SRT07Z Replacement of Right Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach 0SRT0JZ Replacement of Right Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach 0SRT0KZ Replacement of Right Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach 0SRU07Z Replacement of Left Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach 0SRU0JZ Replacement of Left Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach 0SRU0KZ Replacement of Left Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach 0SRV07Z Replacement of Right Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach 0SRV0JZ Replacement of Right Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach 0SRV0KZ Replacement of Right Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach 0SRW07Z Replacement of Left Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach 0SRW0JZ Replacement of Left Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach 0SRW0KZ 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.”	
Exclusions	This measure excludes index admissions for patients: 1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge; 2. Who were transferred in to the index hospital;	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 Hip/knee readmission measure excludes admissions for patients: 1) Without at least 30 days post-discharge enrollment in Medicare FFS; 2) Discharged against medical advice;

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	3. Who leave the hospital against medical advice (AMA); 4. With more than two THA/TKA procedures codes during the index hospitalization; or 5. Who cannot be attributed to a billing surgeon or operator using claims data After applying the exclusion criteria above, 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.	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.	3) Admitted for the index procedure and subsequently transferred to another acute care facility; 4) Who had more than two THA/TKA procedure codes during the index hospitalization; or 5) Who had THA/TKA admissions within 30 days of a prior THA/TKA index admission.
Exclusion Details	The measure excludes admissions for patients: 1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge Rationale: Only patients with adequate claims data for attribution should be included in risk-adjustment model and the measure. 2. Who were transferred in to the index hospital Rationale: If the patient is transferred from another acute care facility to the hospital where the index procedure occurs, it is likely that the procedure is not elective, or that the admission is associated with an acute condition. 3. Who leave the hospital against medical advice (AMA) Rationale: Clinicians have limited opportunity to implement high quality care. 4. With more than two THA/TKA procedures 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, and this may reflect a coding error. 5. Who cannot be attributed to a billing surgeon or operator using claims data Rationale: Only patients with adequate clinician claims for attribution should be included in risk-adjustment model and the measure.	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.	This measure excludes index admissions for patients: 1. Without at least 30 days of post-discharge enrollment in Medicare FFS as determined by examining the Medicare Enrollment Database (EDB). Rationale: The 30-day readmission outcome cannot be assessed in this group since claims data are used to determine whether a patient was readmitted. 2. Discharged against medical advice, which are identified by examining the discharge destination indicator in claims data. Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. Admitted for the index procedure and subsequently transferred to another acute care facility as identified in claims data, which are defined as when a patient with an inpatient hospital admission (with at least one qualifying THA/TKA procedure) is discharged from an acute care hospital and admitted to another acute care hospital on the same or next day.
Risk Adjustment	Statistical risk model	Statistical risk model	Statistical risk model
Stratification	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
Algorithm	In Dataset April 2013 to March 2016 (prior to exclusions being applied): We started with the hospital HKC measure cohort, with an initial index cohort size of 982,436 index admissions with an elective primary THA/TKA procedure. After applying exclusion criteria 1 through 4 listed in the table below, we have a cohort sample size of 935,029 index admissions. Our previous NQF filing for hospital HKC showed no bias introduced through the exclusion process for hospitals for this same cohort of 935,029 index admissions. We then further excluded 10,243 (1.0%) index admissions (criteria 5 and 6 below) which cannot be attributed to physician/physician group to create our final measure cohort.	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	The measure estimates hospital-level 30-day all-cause RSRRs 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 readmission 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 a readmission at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering

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	The measure estimates eligible clinician or clinician group ("provider")-level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and provider 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 provider-specific intercept. At the provider level, it models the provider-specific intercepts as arising from a normal distribution. The provider intercept represents the underlying risk of a complication for patients treated by the provider, after accounting for patient risk. The provider-specific intercepts are given a distribution to account for the clustering (non-independence) of patients treated by the same provider. If there were no differences among providers, then after adjusting for patient risk, the provider intercepts should be identical across all providers. The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given provider, multiplied by the national observed complication rate. The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the provider-specific intercept on the risk of having an admission with a complication. The estimated provider-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 provider 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 providers in our sample is added in place of the provider-specific effect. The results are log transformed and summed over all patients in the provider to get an expected value. To assess provider performance for each reporting period, we re-estimate the model coefficients using the years of data in that period. For each provider, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the provider's performance with its observed case mix, and the denominator is the number of complications expected based on the nation's performance with that provider'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 provider's performance given its case mix to an average provider'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. 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).	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.	(non-independence) of patients within the same hospital. If there were no differences among hospitals after adjusting for patient risk, the hospital intercepts should be identical across all hospitals. The RSRR is calculated as the ratio of the number of "predicted" to the number of "expected" readmission at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of readmissions 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 readmission rates or better quality, and a higher ratio indicates higher-than-expected readmission rates or worse quality. The "predicted" number of readmissions (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of readmission. 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 readmissions (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 readmission 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 30-Day All-Cause Risk-Standardized Readmission 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.

	3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups	1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)	1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
	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		
Submission items	5.1 Identified measures: 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: The measure is fully harmonized with NQF #1550 regarding cohort definition, outcome, and risk adjustment approach. The only discrepancy is the attribution approach, which assigns each index admission to a clinician rather than a hospital, and the exclusion of patients for which no billing surgeon or operator can be identified. 5b.1 If competing, why superior or rationale for additive value: Clinicians, particularly the surgeon performing the procedure, can influence the outcome of surgery for better or worse, both through their technical skill and through their influence on the care team and hospital safety culture. Therefore, many of the strategies and best practices used by hospitals to reduce the risk of complications can also be adopted by individual clinicians and groups of clinicians to improve patient outcomes. Further evidence of surgeons' influence are data indicating that increasing surgeon volume is associated with reductions in adverse surgical outcomes (Battaglia TC et al., 2006; Shervin et al., 2007). The THA/TKA risk-standardized complication rate (RSCR) measure for clinicians is thus intended to inform quality-of-care improvement efforts, as individual process-based performance measures cannot encompass all the complex and critical aspects of care that contribute to patient outcomes. It also complements the hospital measure as a proportion of surgeons have very different performance quality than the institutions in which they perform surgery; this measure provides a transparent reflection of these discordances to further support quality improvement. References: Battaglia TC, Mulhall KJ, Brown TE, Saleh KJ. Increased surgical volume is associated with lower THA dislocation rates. Clin Orthop Relat Res. 2006 Jun;447:28-33. Shervin N, Rubash HE, Katz JN. Orthopaedic procedure volume and patient outcomes: a systematic literature review. Clin Orthop Relat Res. 2007 Apr;457:35-41.	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	5.1 Identified measures: 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 1550 : Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) 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 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

Comparison of NQF 3494, NQF 0230, NQF 0119, NQF 2515, and NQF 2558

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Steward	Centers for Medicare & Medicaid Services (CMS)	Centers for Medicare & Medicaid Services (CMS)	The Society of Thoracic Surgeons	Karen | Dorsey | karen.dorsey@yale.edu | 203-764-5700-	Centers for Medicare & Medicaid Services
Description	This measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 90 days of the procedure date of an index CABG admission. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. This measure may be used in one or more to be defined 90-day payment models.	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.	Percent of patients aged 18 years and older undergoing isolated CABG who die, including both 1) all deaths occurring during the hospitalization in which the CABG was performed, even if after 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure	The measure estimates a hospital-level risk-standardized readmission rate (RSRR), defined as unplanned readmission for any cause within 30 days from the date of discharge of the index CABG procedure, for patients 18 years and older discharged from the hospital after undergoing a qualifying isolated CABG procedure. 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. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the readmission outcome.	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.
Type	Outcome	Outcome	Outcome	Outcome	Outcome
Data Source	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 (2009-2013): We examined disparities in performance according to the proportion of patients in each hospital who were dual eligible for both Medicare and Medicaid insurances. We also used the Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status (SES) index score derived from the American Community Survey	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	Registry Data STS Adult Cardiac Surgery Database Version 2.81 (effective July 1, 2014); Version 2.9 (effective July 1, 2017) Available at measure-specific web page URL identified in S.1 Attachment S.15._Isolated_CABG_Risk_Model_Specifications-635307506255634552.doc	Facility Inpatient/Hospital Attachment NQF_2515_CABG_Readmission_Data_Dictionary_01-11-17_v1.0.xlsx	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

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	(2009-2013) to study the association between our measure and SES. Master Beneficiary Summary File (MBSF) The MBSF is an annually created file that contains enrollment information for all Medicare beneficiaries, including dual eligible status. Years 2014-2017 were used. The Society of Thoracic Surgeons (STS) CABG Composite Online Star Ratings Empiric validity testing was performed using the publicly available measure score of the Society of Thoracic Surgery (STS) CABG Composite Online Star Rating, which combines several measures across quality domains to score hospitals from one (low quality) to three (high quality) stars (The Society of Thoracic Surgeons, 2017). References 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. The Society of Thoracic Surgeons. STS Public Reporting Online. CABG Overall Composite Score. 2017. Available at:https://publicreporting.sts.org/search/cabg_report_card/hospital?title=&field_year_target_id=11&field_state_value=All. Accessed December 1, 2018. No data collection instrument provided Attachment Del18gHOP590DayCABGMortalityMeasureDataDictionary01042019-636824525665955768.xlsx	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			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
Level	Facility	Facility	Facility, Clinician : Group/Practice	N/A. This measure is not a composite performance measure.	Facility
Setting	Inpatient/Hospital	Inpatient/Hospital	Inpatient/Hospital	NQF_2515_CABG_Readmission_NQF_Evidence_Attachment_01-11-17_v1.0.docx	Inpatient/Hospital

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Numerator Statement	The outcome for this measure is 90-day all-cause mortality. Mortality is defined as death for any reason within 90 days of the procedure date from the index admission for patients 65 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.	Number of patients undergoing isolated CABG who die, including both 1) all deaths occurring during the hospitalization in which the operation was performed, even if after 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure	The index cohort includes admissions for patients aged 18 years or older who received a qualifying "isolated" CABG procedure (CABG procedure without other concurrent major cardiac procedure such as a valve replacement). All patients in the cohort are alive at discharge (i.e., no in-hospital death). The measure was developed in a cohort of patients 65 years and older who were enrolled in Medicare FFS and admitted to non-federal hospitals. To be included in the Medicare FFS cohort, patients had to have a qualifying isolated CABG procedure AND had to be continuously enrolled in Medicare Fee-for-Service (FFS) one year prior to the first day of the index hospitalization and through 30 days post-discharge. This cohort is defined using the ICD-9 and ICD-10 Clinical Modification procedure codes identified in Medicare Part A Inpatient claims data. The ICD-10 specifications are attached in the Data Dictionary. ICD-9 and ICD-10 procedure codes that indicate a patient has undergone a NON-isolated CABG procedure (CABG surgeries that occur concomitantly with procedures that elevate patients' readmission risk) and thus does not meet criteria for inclusion in the measure cohort are listed in the attached Data Dictionary. ICD-9-CM codes that define the cohort: 36.10 - Aortocoronary bypass for heart revascularization, not otherwise specified 36.11 - (Aorto) coronary bypass of one coronary artery 36.12 - (Aorto coronary bypass of two coronary arteries 36.13 - (Aorto) coronary bypass of three coronary arteries 36.14 - (Aorto) coronary bypass of four or more coronary arteries 36.15 - Single internal mammary- coronary artery bypass 36.16 - Double internal mammary- coronary artery bypass 36.17 - Abdominal- coronary artery bypass 36.19 - Other bypass anastomosis for heart revascularization	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.

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Numerator Details	This is an all-cause mortality measure, therefore any death within 90 days of the index procedure date from the index hospitalization is included in the measure outcome. We identify deaths for Medicare FFS patients 65 years or older using the Medicare Enrollment Database (EDB). Numerator time window: 90 days from the procedure date of index CABG procedure. This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define the outcome and to which hospital the outcome is attributed when there are multiple hospitalizations within a single episode of care. Outcome Attribution: Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves an index CABG procedure (i.e., the patient is either transferred into the hospital that performs the index CABG or is transferred out to another hospital following the index CABG) 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 90-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	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/QnetTier3&cid=1163010421830. Accessed May 4, 2018.	Number of isolated CABG procedures with an operative mortality; Number of isolated CABG procedures in which Mortality [Mortalty (STS Adult Cardiac Surgery Database Version 2.9)] and Mortality Operative Death (MtOpD) are marked "yes." Operative mortality is further verified by the following variables: Mortality Status at 30 days (Mt30Stat), Mortality Date (MtDate), Mortality Discharge Status (MtDCStat)	In order to create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures). For all cohorts, hospitalizations are excluded if they meet any of the following criteria, for admissions: 1. Without at least 30 days post-discharge enrollment in FFS Medicare 2. Discharged against medical advice (AMA) 3. Admissions for subsequent qualifying CABG procedures during the measurement period	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.

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	90-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 90-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	This claims-based measure can be used in the patient cohort aged 65 years or older. 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 the measure period, the first CABG admission is selected for inclusion in the measure and the subsequent CABG admission(s) are excluded from the cohort.	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.	All patients undergoing isolated CABG	In order to create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures). For all cohorts, hospitalizations are excluded if they meet any of the following criteria: 1. Without at least 30 days post-discharge enrollment in FFS Medicare Rationale: The 30-day readmission outcome cannot be assessed in this group since claims data are used to determine whether a patient was readmitted. 2. Discharged against medical advice (AMA) Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge. 3. Admissions for subsequent qualifying CABG procedures during 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	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.

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
				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 from the cohort.	
Denominator Details	The measure includes index admissions for patients: 1. Having a qualifying isolated CABG surgery during the index admission; 2. Enrolled in Medicare 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: • Valve procedures; • Atrial and/or ventricular septal defects; • Congenital anomalies; • Other open cardiac procedures; • Heart transplants; • Aorta or other non-cardiac arterial bypass procedures; • Head, neck, intracranial vascular procedures; or, • Other chest and thoracic procedures This cohort is defined using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-09-CM) procedure codes and/or International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-Procedure Coding System [PCS]) procedure codes identified in Medicare Part A Inpatient claims data. To create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures see exclusion). ICD-09-CM and ICD-10-PCS procedure codes that indicate a patient has undergone a non-isolated CABG procedure	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.	Number of isolated CABG procedures. The SQL code used to create the function to identify cardiac procedures is provided in the appendix.	N/A	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.

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	(CABG surgeries that occur concomitantly with procedures that elevate patients' mortality risk) and thus does not meet criteria for inclusion in the measure cohort are used to identify such patients for removal from the cohort. The ICD-09-CM and ICD-10-PCS procedure codes are listed in the attached Data Dictionary.				
Exclusions	The 90-day CABG surgery mortality measure excludes index admissions for patients: 1) With inconsistent or unknown vital status or other unreliable data. 2) Who leave the hospital against medical advice (AMA). 3) With qualifying CABG procedures subsequent to another qualifying CABG procedure during the measurement period.	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.	N/A	Statistical risk model	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	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	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	N/A		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

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	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 a 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.	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.			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	Statistical risk model	Statistical risk model	Statistical risk model	better quality = lower score	Statistical risk model
Stratification	N/A	N/A	N/A	Rate/proportion	N/A
Type Score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	Rate/proportion better quality = lower score	We calculate hospital-specific risk-standardized readmission rates (RSRRs). These rates are obtained as the ratio of predicted to expected readmissions, multiplied by the national unadjusted rate. The expected	Rate/proportion better quality = lower score

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				number of readmissions in each hospital is es N/A. This measure is not based on a sample or survey. N/A. This measure is not based on a sample or survey.	
Algorithm	The measure estimates hospital-level, 90-day, all-cause, RSMRs for CABG surgery using a hierarchical logistic regression model. 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 90 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 90 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 specific hospital's performance, given its case mix, to be compared to an average hospital's performance with the same case mix. Thus, a lower rate indicates lower-than-expected mortality rates or better quality, while a higher rate indicates higher-than-expected mortality rates or worse quality.	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.	Please refer to numerator and denominator sections for detailed information.	Claims	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

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	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 90-day CABG mortality measure methodology report (YNHHS/CORE, 2018). References Normand S-LT, Shahian DM. 2007. Statistical and clinical aspects of hospital outcomes profiling. Statistical Science 22(2): 206-226. Yale New Haven Health System/Center for Outcomes Research & Evaluation (YNHHS/CORE). Hospital-Level 90-day All-Cause Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery; Updated Measure Methodology Report. 2018.	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.			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
Submission items	5.1 Identified measures: 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: The target population is isolated CABG patients for the proposed 90-day CABG mortality measure and all of the above measures that have different measure focus but same target population. The clinical cohort exclusions are harmonized	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)	5.1 Identified measures: 0114 : Risk-Adjusted Postoperative Renal Failure 0115 : Risk-Adjusted Surgical Re-exploration 0116 : Anti-Platelet Medication at Discharge 0117 : Beta Blockade at Discharge 0118 : Anti-Lipid Treatment Discharge 0120 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)	5.1 Identified measures: The proposed CABG readmission measure, which has been developed in close collaboration with STS, has a target population (i.e., isolated CABG patients) that is harmonized with the above measures to the extent possible given the differences between clinical and administrative data. The exclusions are nearly identical to the STS measures' cohort	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

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
	to the extent possible given the differences between clinical registry (STS) and administrative claims data. The exclusions are nearly identical to the STS measures' cohort exclusions with the exception of epicardial MAZE procedures; STS excludes these procedures from the registry-based CABG mortality measure cohort because the version of registry data used for measure development did not allow for differentiation of epicardial and open maze procedures. 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 30-day isolated CABG mortality and readmission measures, which utilize the same definition of isolated CABG as this 90-day mortality measure, were validated using clinical registry data (STS Cardiac Surgery Registry data for the readmission measure and New York State Cardiac Surgery Registry data for the mortality 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: This measure was specifically developed for and may be used in 90-day payment models. It is not intended to replace the 30-day CABG mortality measure in its current programmatic use or public reporting.	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	0127 : Preoperative Beta Blockade 0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation) 0130 : Risk-Adjusted Deep Sternal Wound Infection 0131 : Risk-Adjusted Stroke/Cerebrovascular Accident 0134 : Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG) 0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery 0121 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement 0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery 1501 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair 1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery 5a.1 Are specs completely harmonized? Yes 5a.2 If not completely harmonized, identify difference, rationale, impact: 5b.1 If competing, why superior or rationale for additive value: N/A	exclusions with the exception of epicardial MAZE procedures; STS excludes these procedures from the registry-based CABG readmission measure cohort because the version of registry data used for measure development did not allow them to differentiate them from open maze procedures. The age range for the proposed CABG readmission and existing NQF-endorsed STS measure cohorts differs; STS measures are specified for age 18 and over, and the proposed CABG readmission measure is currently specified for age 65 and over. However, we have performed testing in patients 18 years and over and determined the measure performs well across all adult patients and payers. The proposed CABG readmission measure is harmonized with the above measures to the extent possible given the different data sources used for development and reporting. 5a.1 Are specs completely harmonized? Attachment 5a.2 If not completely harmonized, identify difference, rationale, impact: CABG_Readmission_MeasureMethodologyReport_02-01-14_Final.pdf 5b.1 If competing, why superior or rationale for additive value: Centers for Medicare & Medicaid Services	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

	3494 Hospital 90-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	0119 Risk-Adjusted Operative Mortality for CABG	2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery	2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
					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.

Appendix E2: Related and Competing Measures (narrative version)

Comparison of NQF 0456, NQF 0113, and NQF 0734

0456 Participation in a Systematic National Database for General Thoracic Surgery
0113 Participation in a Systematic Database for Cardiac Surgery
0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Steward

0456 Participation in a Systematic National Database for General Thoracic Surgery

The Society of Thoracic Surgeons

0113 Participation in a Systematic Database for Cardiac Surgery

STS Quality Measurement Task Force. Roster available upon request.

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

The Society of Thoracic Surgeons

Description

0456 Participation in a Systematic National Database for General Thoracic Surgery

Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.

0113 Participation in a Systematic Database for Cardiac Surgery

Surgery : Cardiac Surgery, Surgery

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.

Type

0456 Participation in a Systematic National Database for General Thoracic Surgery

Structure

0113 Participation in a Systematic Database for Cardiac Surgery

Participation in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Structure

Data Source

0456 Participation in a Systematic National Database for General Thoracic Surgery

Registry Data STS General Thoracic Surgery Database – Version 2.2

Available at measure-specific web page URL identified in S.1 No data dictionary

0113 Participation in a Systematic Database for Cardiac Surgery

Registry STS Adult Cardiac Surgery Database – Version 2.73; STS Adult Cardiac Surgery Database Version 2.8 will go live on July 1, 2014.

Available at measure-specific web page URL identified in S.1 Does the facility participate in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data? (y/n) 12 months

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Registry Data STS Congenital Heart Surgery Database Version 3.22

Available at measure-specific web page URL identified in S.1 No data dictionary

Level

0456 Participation in a Systematic National Database for General Thoracic Surgery

Clinician : Group/Practice

0113 Participation in a Systematic Database for Cardiac Surgery

Facility, Clinician : Group/Practice, Other

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Clinician : Group/Practice, Other

Setting

0456 Participation in a Systematic National Database for General Thoracic Surgery

Inpatient/Hospital

0113 Participation in a Systematic Database for Cardiac Surgery

Hospital

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Inpatient/Hospital

Numerator Statement

0456 Participation in a Systematic National Database for General Thoracic Surgery

Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.

Numerator Details

0456 Participation in a Systematic National Database for General Thoracic Surgery

Participation in the STS General Thoracic Surgery Database is initiated by the surgeons and or/hospital and requires semiannual submission via an approved software system to the Duke Clinical Research Institute (DCRI), the data repository for the three STS Databases. The General Thoracic Surgery Database accepts data from General Surgeons performing Thoracic procedures as well as Thoracic Surgeons.

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Participation is defined as submission of all congenital and pediatric operations performed to the database.

Denominator Statement

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

No risk adjustment or risk stratification

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

Denominator Details

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

Exclusions

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

Exclusion Details

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

Risk Adjustment

0456 Participation in a Systematic National Database for General Thoracic Surgery

No risk adjustment or risk stratification

0113 Participation in a Systematic Database for Cardiac Surgery

Categorical

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

No risk adjustment or risk stratification

Stratification

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

Type Score

0456 Participation in a Systematic National Database for General Thoracic Surgery

Categorical, e.g., yes/no passing score defines better quality

0113 Participation in a Systematic Database for Cardiac Surgery

passing score defines better quality N/A No diagram provided

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Categorical, e.g., yes/no passing score defines better quality

Algorithm

0456 Participation in a Systematic National Database for General Thoracic Surgery

See S.4 - S.5

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

See S.4 - S.5

Submission items

0456 Participation in a Systematic National Database for General Thoracic Surgery

5.1 Identified measures: 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures

0113 : Participation in a Systematic Database for Cardiac Surgery

0734 : Participation in a National Database for Pediatric and Congenital Heart Surgery

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0734 (both STS) are for different patient and surgical case populations

5b.1 If competing, why superior or rationale for additive value:

0113 Participation in a Systematic Database for Cardiac Surgery

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact: The Society of Thoracic Surgeons

5b.1 If competing, why superior or rationale for additive value: Mark | Antman | mantman@sts.org | 312-202-5856-

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

5.1 Identified measures: 0456 : Participation in a Systematic National Database for General Thoracic Surgery

0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures

0113 : Participation in a Systematic Database for Cardiac Surgery

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0456 (both STS) are for different patient and surgical case populations

5b.1 If competing, why superior or rationale for additive value:

Comparison of NQF 2683 and NQF 0339

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery
0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Steward

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

The Society of Thoracic Surgeons

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Agency for Healthcare Research and Quality

Description

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams.

[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.]

Type

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Outcome

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Outcome

Data Source

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

Available at measure-specific web page URL identified in S.1 No data dictionary

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions.

URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx

Level

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Clinician : Group/Practice

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Facility

Setting

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Inpatient/Hospital

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Inpatient/Hospital

Numerator Statement

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Numerator Details

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Number of index pediatric and/or congenital heart surgery operations with an operative mortality;

Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0):

1. Mortality status at database discharge (MtDBDisStat)
2. Status at 30 days after surgery (Mt30Stat)

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Denominator Statement

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

All patients undergoing index pediatric and/or congenital heart surgery

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

Denominator Details

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Number of index pediatric and/or congenital heart surgery operations. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations, please refer to the data collection form and data specifications documents which can be accessed using the URLs provided in S.1 above.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

ICD-9-CM Congenital heart disease procedure codes (1P)1:

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

3505 ENDOVAS REPL AORTC VALVE

3506 TRNSAPCL REP AORTC VALVE

3507 ENDOVAS REPL PULM VALVE

3508 TRNSAPCL REPL PULM VALVE

3510 OPEN VALVULOPLASTY NOS

3511 OPN AORTIC VALVULOPLASTY

3512 OPN MITRAL VALVULOPLASTY

3513 OPN PULMON VALVULOPLASTY

3514 OPN TRICUS VALVULOPLASTY

3520 OPN/OTH REP HRT VLV NOS

3521 OPN/OTH REP AORT VLV-TIS

3522 OPN/OTH REP AORTIC VALVE

3523 OPN/OTH REP MTRL VLV-TIS

3524 OPN/OTH REP MITRAL VALVE

3525 OPN/OTH REP PULM VLV-TIS
3526 OPN/OTH REPL PUL VALVE
3527 OPN/OTH REP TCSPD VLV-TS
3528 OPN/OTH REPL TCSPD VALVE
3531 PAPILLARY MUSCLE OPS
3532 CHORDAE TENDINEAE OPS
3533 ANNULOPLASTY
3534 INFUNDIBULECTOMY
3535 TRABECUL CARNEAE CORD OP
3539 TISS ADJ TO VALV OPS NEC
3541 ENLARGE EXISTING SEP DEF
3542 CREATE SEPTAL DEFECT
3550 PROSTH REP HRT SEPTA NOS
3551 PROS REP ATRIAL DEF-OPN
3552 PROS REPAIR ATRIA DEF-CL
3553 PROS REP VENTRIC DEF-OPN
3554 PROS REP ENDOCAR CUSHION
3560 GRFT REPAIR HRT SEPT NOS
3561 GRAFT REPAIR ATRIAL DEF
3562 GRAFT REPAIR VENTRIC DEF
3563 GRFT REP ENDOCAR CUSHION
3570 HEART SEPTA REPAIR NOS
3571 ATRIA SEPTA DEF REP NEC
3572 VENTR SEPTA DEF REP NEC
3573 ENDOCAR CUSHION REP NEC
3581 TOT REPAIR TETRAL FALLOT
3582 TOTAL REPAIR OF TAPVC
3583 TOT REP TRUNCUS ARTERIOS
3584 TOT COR TRANSPOS GRT VES
3591 INTERAT VEN RETRN TRANSP
3592 CONDUIT RT VENT-PUL ART
3593 CONDUIT LEFT VENTR-AORTA
3594 CONDUIT ARTIUM-PULM ART
3595 HEART REPAIR REVISION
3598 OTHER HEART SEPTA OPS
3599 OTHER HEART VALVE OPS
3699 HEART VESSEL OP NEC
3733 EXC/DEST HRT LESION OPEN
3736 EXC,DESTRCT,EXCLUS LAA

375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

390 SYSTEMIC-PULM ART SHUNT

3921 CAVAL-PULMON ART ANASTOM

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Non-specific heart surgery procedure codes (2P):

3834 AORTA RESECTION & ANAST

3835 THOR VESSEL RESECT/ANAST

3844 RESECT ABDM AORTA W REPL

3845 RESECT THORAC VES W REPL

3864 EXCISION OF AORTA

3865 THORACIC VESSEL EXCISION

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3949 VASC PROC REVISION NEC

3956 REPAIR VESS W TIS PATCH

3957 REP VESS W SYNTH PATCH

3958 REPAIR VESS W PATCH NOS

3959 REPAIR OF VESSEL NEC

ICD-9-CM Congenital heart disease diagnosis codes (2D)1:

7450 COMMON TRUNCUS

74510 COMPL TRANSPOS GREAT VES

74511 DOUBLE OUTLET RT VENTRIC

74512 CORRECT TRANSPOS GRT VES

74519 TRANSPOS GREAT VESS NEC

7452 TETRALOGY OF FALLOT

7453 COMMON VENTRICLE

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

74560 ENDOCARD CUSHION DEF NOS

74561 OSTIUM PRIMUM DEFECT

74569 ENDOCARD CUSHION DEF NEC

7457 COR BILOCULARE

7458 SEPTAL CLOSURE ANOM NEC

7459 SEPTAL CLOSURE ANOM NOS

74600 PULMONARY VALVE ANOM NOS

74601 CONG PULMON VALV ATRESIA
74602 CONG PULMON VALVE STENOS
74609 PULMONARY VALVE ANOM NEC
7461 CONG TRICUSP ATRES/STEN
7462 EBSTEIN'S ANOMALY
7463 CONG AORTA VALV STENOSIS
7464 CONG AORTA VALV INSUFFIC
7465 CONGEN MITRAL STENOSIS
7466 CONG MITRAL INSUFFICIENC
7467 HYPOPLAS LEFT HEART SYND
74681 CONG SUBAORTIC STENOSIS
74682 COR TRIATRIATUM
74683 INFUNDIB PULMON STENOSIS
74684 OBSTRUCT HEART ANOM NEC
74685 CORONARY ARTERY ANOMALY
74687 MALPOSITION OF HEART
74689 CONG HEART ANOMALY NEC
7469 CONG HEART ANOMALY NOS
7470 PATENT DUCTUS ARTERIOSUS
74710 COARCTATION OF AORTA
74711 INTERRUPT OF AORTIC ARCH
74720 CONG ANOM OF AORTA NOS
74721 ANOMALIES OF AORTIC ARCH
74722 AORTIC ATRESIA/STENOSIS
74729 CONG ANOM OF AORTA NEC
7473 PULMONARY ARTERY ANOM
74731 PULMON ART COARCT/ATRES
74732 PULMONARY AV MALFORMATN
74739 OTH ANOM PUL ARTERY/CIRC
74740 GREAT VEIN ANOMALY NOS
74741 TOT ANOM PULM VEN CONNEC
74742 PART ANOM PULM VEN CONN
74749 GREAT VEIN ANOMALY NEC

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

Exclusions

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

- Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure.
- All operations where the primary procedure is either pectus repair or bronchoscopy are not classified as cardiac operations (i.e., they are thoracic procedures) and thus, they are excluded from the denominator

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Exclude cases:

• with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for heart transplant (7P)

• with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA†

• with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA†

• age less than or equal to 30 days with PDA†

• transferring to another short-term hospital (DISP=2)

• neonates with birth weight less than 500 grams (Birth Weight Category 1)

• MDC 14 (pregnancy, childbirth and pueperium)

• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

† PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code.

See Pediatric Quality Indicators Appendices:

• Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn

• Appendix L- Low Birth Weight Categories

Exclusion Details

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Weight in kilograms [WeightKg (STS Congenital Heart Surgery Database Version 3.0)] = 2.5 kg and primary procedure (PrimProc) is marked "1330 = PDA closure, Surgical"; primary procedure (PrimProc) is marked "1430 = Pectus repair" or "1870 = Bronchoscopy"

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

ICD-9-CM Closed heart valvotomy procedure codes (3AP):

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

ICD-9-CM Atrial septal enlargement procedure codes (3BP):

3541 ENLARGE EXISTING SEP DEF

3542 CREATE SEPTAL DEFECT

ICD-9-CM Atrial septal defect repair procedure codes (3CP):

3551 PROS REP ATRIAL DEF-OPN

3571 ATRIA SEPTA DEF REP NEC

ICD-9-CM Ventricular septal defect repair procedure codes (3DP):

3553 PROS REP VENTRIC DEF-OPN

3572 VENTR SEPTA DEF REP NEC

ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP):

3885 OCCLUDE THORACIC VES NEC

ICD-9-CM PDA closure diagnosis code (3D):

7470 PATENT DUCTUS ARTERIOSUS

ICD-9-CM Other surgical occlusion procedure codes (3FP):

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3959 REPAIR OF VESSEL NEC

ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P):

3541 ENLARGE EXISTING SEP DEF

3552 PROS REPAIR ATRIA DEF-CL

ICD-9-CM Extracorporeal circulation procedure code (5P):

3961 EXTRACORPOREAL CIRCULAT

ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D):

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

ICD-9-CM Catheterization procedure codes (6P):

3721 RT HEART CARDIAC CATH

3722 LEFT HEART CARDIAC CATH

3723 RT/LEFT HEART CARD CATH

8842 CONTRAST AORTOGRAM

8843 CONTR PULMON ARTERIOGRAM

8844 CONTR THOR ARTERIOGR NEC

8850 ANGIOCARDIOGRAPHY NOS

8851 VENA CAV ANGIOCARDIOGRAM

8852 RT HEART ANGIOCARDIOGRAM

8853 LT HEART ANGIOCARDIOGRAM

8854 RT & LT HEART ANGIOCARD

8855 CORONAR ARTERIOGR-1 CATH

8856 CORONAR ARTERIOGR-2 CATH

8857 CORONARY ARTERIOGRAM NEC

8858 NEGATVE-CONTR CARDIOGRAM

ICD-9-CM Heart transplant procedure codes (7P)1:

375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Premature infant diagnosis codes (4D):

76500 EXTREME IMMATUR WTNOS

76501 EXTREME IMMATUR <500G

76502 EXTREME IMMATUR 500-749G

76503 EXTREME IMMATUR 750-999G

76504 EXTREME IMMAT 1000-1249G

76505 EXTREME IMMAT 1250-1499G

76506 EXTREME IMMAT 1500-1749G

76507 EXTREME IMMAT 1750-1999G

76508 EXTREME IMMAT 2000-2499G

76509 EXTREME IMMAT 2500+G

76510 PRETERM INFANT NEC WTNOS

76511 PRETERM NEC <500G

76512 PRETERM NEC 500-749G

76513 PRETERM NEC 750-999G

76514 PRETERM NEC 1000-1249G

76515 PRETERM NEC 1250-1499G

76516 PRETERM NEC 1500-1749G

76517 PRETERM NEC 1750-1999G

76518 PRETERM NEC 2000-2499G

76519 PRETERM NEC 2500+G

Risk Adjustment

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Statistical risk model

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Statistical risk model

Stratification

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.

Type Score

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Rate/proportion better quality = lower score

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Rate/proportion better quality = lower score

Algorithm

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Please refer to numerator and denominator sections for detailed information.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.

Submission items

2683 Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measure is based on clinical registry data.

5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature –

Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4].

First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical

registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between data sources for half of the benchmark operations. The negative predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p = 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment.

Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9:

- accidental miscoding
- coding performed by medical records clerks who have never seen the actual patient
- contradictory or poorly described information in the medical record
- lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9
- inadequately trained medical coders.

Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.)

References

1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603.

2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. J Perinatol 2005;25:737-42.

3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100.

4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

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: No competing measures found.

Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

Comparison of NQF 0732 and NQF 0339

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories
0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Steward

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

The Society of Thoracic Surgeons

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Agency for Healthcare Research and Quality

Description

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Surgical volume for pediatric and congenital heart surgery: total programmatic volume and programmatic volume stratified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams.

[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.]

Type

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Structure

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Outcome

Data Source

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

Available at measure-specific web page URL identified in S.1 No data dictionary

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions.

URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx

Level

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Clinician : Group/Practice

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Facility

Setting

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Inpatient/Hospital

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Inpatient/Hospital

Numerator Statement

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

1) Total number of pediatric and congenital cardiac surgery operations and 2) number of pediatric and congenital cardiac surgery operations in each of the strata of complexity specified by the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories), a multi-institutional validated complexity stratification tool

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Numerator Details

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Please see Appendix.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Denominator Statement

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

Denominator Details

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

ICD-9-CM Congenital heart disease procedure codes (1P)1:

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

3505 ENDOVAS REPL AORTC VALVE

3506 TRNSAPCL REP AORTC VALVE

3507 ENDOVAS REPL PULM VALVE

3508 TRNSAPCL REPL PULM VALVE

3510 OPEN VALVULOPLASTY NOS

3511 OPN AORTIC VALVULOPLASTY

3512 OPN MITRAL VALVULOPLASTY

3513 OPN PULMON VALVULOPLASTY

3514 OPN TRICUS VALVULOPLASTY

3520 OPN/OTH REP HRT VLV NOS

3521 OPN/OTH REP AORT VLV-TIS

3522 OPN/OTH REP AORTIC VALVE

3523 OPN/OTH REP MTRL VLV-TIS

3524 OPN/OTH REP MITRAL VALVE

3525 OPN/OTH REP PULM VLV-TIS

3526 OPN/OTH REPL PUL VALVE
3527 OPN/OTH REP TCSPD VLV-TS
3528 OPN/OTH REPL TCSPD VALVE
3531 PAPILLARY MUSCLE OPS
3532 CHORDAE TENDINEAE OPS
3533 ANNULOPLASTY
3534 INFUNDIBULECTOMY
3535 TRABECUL CARNEAE CORD OP
3539 TISS ADJ TO VALV OPS NEC
3541 ENLARGE EXISTING SEP DEF
3542 CREATE SEPTAL DEFECT
3550 PROSTH REP HRT SEPTA NOS
3551 PROS REP ATRIAL DEF-OPN
3552 PROS REPAIR ATRIA DEF-CL
3553 PROS REP VENTRIC DEF-OPN
3554 PROS REP ENDOCAR CUSHION
3560 GRFT REPAIR HRT SEPT NOS
3561 GRAFT REPAIR ATRIAL DEF
3562 GRAFT REPAIR VENTRIC DEF
3563 GRFT REP ENDOCAR CUSHION
3570 HEART SEPTA REPAIR NOS
3571 ATRIA SEPTA DEF REP NEC
3572 VENTR SEPTA DEF REP NEC
3573 ENDOCAR CUSHION REP NEC
3581 TOT REPAIR TETRAL FALLOT
3582 TOTAL REPAIR OF TAPVC
3583 TOT REP TRUNCUS ARTERIOS
3584 TOT COR TRANSPOS GRT VES
3591 INTERAT VEN RETRN TRANSP
3592 CONDUIT RT VENT-PUL ART
3593 CONDUIT LEFT VENTR-AORTA
3594 CONDUIT ARTIUM-PULM ART
3595 HEART REPAIR REVISION
3598 OTHER HEART SEPTA OPS
3599 OTHER HEART VALVE OPS
3699 HEART VESSEL OP NEC
3733 EXC/DEST HRT LESION OPEN
3736 EXC,DESTRCT,EXCLUS LAA
375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

390 SYSTEMIC-PULM ART SHUNT

3921 CAVAL-PULMON ART ANASTOM

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Non-specific heart surgery procedure codes (2P):

3834 AORTA RESECTION & ANAST

3835 THOR VESSEL RESECT/ANAST

3844 RESECT ABDM AORTA W REPL

3845 RESECT THORAC VES W REPL

3864 EXCISION OF AORTA

3865 THORACIC VESSEL EXCISION

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3949 VASC PROC REVISION NEC

3956 REPAIR VESS W TIS PATCH

3957 REP VESS W SYNTH PATCH

3958 REPAIR VESS W PATCH NOS

3959 REPAIR OF VESSEL NEC

ICD-9-CM Congenital heart disease diagnosis codes (2D)1:

7450 COMMON TRUNCUS

74510 COMPL TRANSPOS GREAT VES

74511 DOUBLE OUTLET RT VENTRIC

74512 CORRECT TRANSPOS GRT VES

74519 TRANSPOS GREAT VESS NEC

7452 TETRALOGY OF FALLOT

7453 COMMON VENTRICLE

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

74560 ENDOCARD CUSHION DEF NOS

74561 OSTIUM PRIMUM DEFECT

74569 ENDOCARD CUSHION DEF NEC

7457 COR BILOCULARE

7458 SEPTAL CLOSURE ANOM NEC

7459 SEPTAL CLOSURE ANOM NOS

74600 PULMONARY VALVE ANOM NOS

74601 CONG PULMON VALV ATRESIA

74602 CONG PULMON VALVE STENOS

74609 PULMONARY VALVE ANOM NEC

7461 CONG TRICUSP ATRES/STEN

7462 EBSTEIN'S ANOMALY

7463 CONG AORTA VALV STENOSIS

7464 CONG AORTA VALV INSUFFIC

7465 CONGEN MITRAL STENOSIS

7466 CONG MITRAL INSUFFICIENC

7467 HYPOPLAS LEFT HEART SYND

74681 CONG SUBAORTIC STENOSIS

74682 COR TRIATRIATUM

74683 INFUNDIB PULMON STENOSIS

74684 OBSTRUCT HEART ANOM NEC

74685 CORONARY ARTERY ANOMALY

74687 MALPOSITION OF HEART

74689 CONG HEART ANOMALY NEC

7469 CONG HEART ANOMALY NOS

7470 PATENT DUCTUS ARTERIOSUS

74710 COARCTATION OF AORTA

74711 INTERRUPT OF AORTIC ARCH

74720 CONG ANOM OF AORTA NOS

74721 ANOMALIES OF AORTIC ARCH

74722 AORTIC ATRESIA/STENOSIS

74729 CONG ANOM OF AORTA NEC

7473 PULMONARY ARTERY ANOM

74731 PULMON ART COARCT/ATRES

74732 PULMONARY AV MALFORMATN

74739 OTH ANOM PUL ARTERY/CIRC

74740 GREAT VEIN ANOMALY NOS

74741 TOT ANOM PULM VEN CONNEC

74742 PART ANOM PULM VEN CONN

74749 GREAT VEIN ANOMALY NEC

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

Exclusions

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Exclude cases:

• with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for heart transplant (7P)

• with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA†

• with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA†

• age less than or equal to 30 days with PDA†

• transferring to another short-term hospital (DISP=2)

• neonates with birth weight less than 500 grams (Birth Weight Category 1)

• MDC 14 (pregnancy, childbirth and pueperium)

• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

† PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code.

See Pediatric Quality Indicators Appendices:

- Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn
- Appendix L- Low Birth Weight Categories

Exclusion Details

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

ICD-9-CM Closed heart valvotomy procedure codes (3AP):

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

ICD-9-CM Atrial septal enlargement procedure codes (3BP):

3541 ENLARGE EXISTING SEP DEF

3542 CREATE SEPTAL DEFECT

ICD-9-CM Atrial septal defect repair procedure codes (3CP):

3551 PROS REP ATRIAL DEF-OPN

3571 ATRIA SEPTA DEF REP NEC

ICD-9-CM Ventricular septal defect repair procedure codes (3DP):

3553 PROS REP VENTRIC DEF-OPN

3572 VENTR SEPTA DEF REP NEC

ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP):

3885 OCCLUDE THORACIC VES NEC

ICD-9-CM PDA closure diagnosis code (3D):

7470 PATENT DUCTUS ARTERIOSUS

ICD-9-CM Other surgical occlusion procedure codes (3FP):

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3959 REPAIR OF VESSEL NEC

ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P):

3541 ENLARGE EXISTING SEP DEF

3552 PROS REPAIR ATRIA DEF-CL

ICD-9-CM Extracorporeal circulation procedure code (5P):

3961 EXTRACORPOREAL CIRCULAT

ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D):

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

ICD-9-CM Catheterization procedure codes (6P):

3721 RT HEART CARDIAC CATH

3722 LEFT HEART CARDIAC CATH

3723 RT/LEFT HEART CARD CATH

8842 CONTRAST AORTOGRAM

8843 CONTR PULMON ARTERIOGRAM

8844 CONTR THOR ARTERIOGR NEC

8850 ANGIOCARDIOGRAPHY NOS

8851 VENA CAV ANGIOCARDIOGRAM

8852 RT HEART ANGIOCARDIOGRAM

8853 LT HEART ANGIOCARDIOGRAM

8854 RT & LT HEART ANGIOCARD

8855 CORONAR ARTERIOGR-1 CATH

8856 CORONAR ARTERIOGR-2 CATH

8857 CORONARY ARTERIOGRAM NEC

8858 NEGATVE-CONTR CARDIOGRAM

ICD-9-CM Heart transplant procedure codes (7P)1:

375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Premature infant diagnosis codes (4D):

76500 EXTREME IMMATUR WTNOS

76501 EXTREME IMMATUR <500G

76502 EXTREME IMMATUR 500-749G

76503 EXTREME IMMATUR 750-999G

76504 EXTREME IMMAT 1000-1249G

76505 EXTREME IMMAT 1250-1499G

76506 EXTREME IMMAT 1500-1749G

76507 EXTREME IMMAT 1750-1999G

76508 EXTREME IMMAT 2000-2499G

76509 EXTREME IMMAT 2500+G

76510 PRETERM INFANT NEC WTNOS

76511 PRETERM NEC <500G

76512 PRETERM NEC 500-749G

76513 PRETERM NEC 750-999G

76514 PRETERM NEC 1000-1249G

76515 PRETERM NEC 1250-1499G

76516 PRETERM NEC 1500-1749G

76517 PRETERM NEC 1750-1999G

76518 PRETERM NEC 2000-2499G

76519 PRETERM NEC 2500+G

Risk Adjustment

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Stratification by risk category/subgroup

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Statistical risk model

Stratification

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Please see Appendix

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.

Type Score

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Count better quality = higher score

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Rate/proportion better quality = lower score

Algorithm

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

Please refer to numerator section and Appendix for detailed information.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality

ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.

Submission items

0732 Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories

5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measures are based on clinical registry data.

5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature –

Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4].

First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between data sources for half of the benchmark operations. The negative predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p

= 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment.

Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9:

- accidental miscoding
- coding performed by medical records clerks who have never seen the actual patient
- contradictory or poorly described information in the medical record
- lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9
- inadequately trained medical coders.

Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.)

References

1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603.

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3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100.

4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

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: No competing measures found.

Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

Comparison of NQF 0733 and NQF 0339

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories
0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Steward

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

The Society of Thoracic Surgeons

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Agency for Healthcare Research and Quality

Description

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Categories, a multi-institutional validated risk stratification tool

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

In-hospital deaths per 1,000 pediatric heart surgery admissions among patients with congenital heart disease ages 17 years and younger. Excludes obstetric discharges; cases with transcatheter interventions as a single cardiac procedure, performed without bypass but with catheterization; cases with septal defect repairs as single cardiac procedures without bypass; cases with heart transplants; premature infants with patent ductus arteriosus (PDA) closure as the only cardiac procedure; age less than 30 days with PDA closure as only cardiac procedure; transfers to another hospital; cases with an unknown disposition; and neonates with birth weight less than 500 grams.

[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.]

Type

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Outcome

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Outcome

Data Source

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Registry Data STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1, 2014.

Available at measure-specific web page URL identified in S.1 No data dictionary

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Claims The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions.

URL Attachment PDI_Regression_Coefficients-_Code_Tables_and_Value_Sets_-_Copy-636426399541614692.xlsx

Level

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Clinician : Group/Practice

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Facility

Setting

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Inpatient/Hospital

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Inpatient/Hospital

Numerator Statement

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure, stratified by the five STAT Mortality Levels, a multi-institutional validated complexity stratification tool

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Numerator Details

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Number of index pediatric and/or congenital heart surgery operations with an operative mortality;

Operative mortality is determined by a combination of the following two data elements (STS Congenital Heart Surgery Database Version 3.0):

1. Mortality status at database discharge (MtDBDisStat)
2. Status at 30 days after surgery (Mt30Stat)

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Denominator Statement

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

All patients undergoing index pediatric and/or congenital heart surgery

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

Denominator Details

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Number of index cardiac operations in each level of complexity stratification using the 5 STAT Mortality Categories, a multi-institutional validated complexity stratification tool. Index operation is defined as the first cardiac operation of a hospitalization. For a complete list of operations and their respective STAT category, please see the Appendix.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Discharges, for patients ages 17 years and younger, with either

• any-listed ICD-9-CM procedure codes for congenital heart disease (1P); or

• any-listed ICD-9-CM procedure codes for non-specific heart surgery (2P) and any-listed ICD-9-CM diagnosis codes for congenital heart disease (2D).

ICD-9-CM Congenital heart disease procedure codes (1P)1:

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

3505 ENDOVAS REPL AORTC VALVE

3506 TRNSAPCL REP AORTC VALVE

3507 ENDOVAS REPL PULM VALVE

3508 TRNSAPCL REPL PULM VALVE

3510 OPEN VALVULOPLASTY NOS

3511 OPN AORTIC VALVULOPLASTY

3512 OPN MITRAL VALVULOPLASTY

3513 OPN PULMON VALVULOPLASTY

3514 OPN TRICUS VALVULOPLASTY

3520 OPN/OTH REP HRT VLV NOS

3521 OPN/OTH REP AORT VLV-TIS

3522 OPN/OTH REP AORTIC VALVE

3523 OPN/OTH REP MTRL VLV-TIS

3524 OPN/OTH REP MITRAL VALVE

3525 OPN/OTH REP PULM VLV-TIS
3526 OPN/OTH REPL PUL VALVE
3527 OPN/OTH REP TCSPD VLV-TS
3528 OPN/OTH REPL TCSPD VALVE
3531 PAPILLARY MUSCLE OPS
3532 CHORDAE TENDINEAE OPS
3533 ANNULOPLASTY
3534 INFUNDIBULECTOMY
3535 TRABECUL CARNEAE CORD OP
3539 TISS ADJ TO VALV OPS NEC
3541 ENLARGE EXISTING SEP DEF
3542 CREATE SEPTAL DEFECT
3550 PROSTH REP HRT SEPTA NOS
3551 PROS REP ATRIAL DEF-OPN
3552 PROS REPAIR ATRIA DEF-CL
3553 PROS REP VENTRIC DEF-OPN
3554 PROS REP ENDOCAR CUSHION
3560 GRFT REPAIR HRT SEPT NOS
3561 GRAFT REPAIR ATRIAL DEF
3562 GRAFT REPAIR VENTRIC DEF
3563 GRFT REP ENDOCAR CUSHION
3570 HEART SEPTA REPAIR NOS
3571 ATRIA SEPTA DEF REP NEC
3572 VENTR SEPTA DEF REP NEC
3573 ENDOCAR CUSHION REP NEC
3581 TOT REPAIR TETRAL FALLOT
3582 TOTAL REPAIR OF TAPVC
3583 TOT REP TRUNCUS ARTERIOS
3584 TOT COR TRANSPOS GRT VES
3591 INTERAT VEN RETRN TRANSP
3592 CONDUIT RT VENT-PUL ART
3593 CONDUIT LEFT VENTR-AORTA
3594 CONDUIT ARTIUM-PULM ART
3595 HEART REPAIR REVISION
3598 OTHER HEART SEPTA OPS
3599 OTHER HEART VALVE OPS
3699 HEART VESSEL OP NEC
3733 EXC/DEST HRT LESION OPEN
3736 EXC,DESTRCT,EXCLUS LAA

375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

390 SYSTEMIC-PULM ART SHUNT

3921 CAVAL-PULMON ART ANASTOM

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Non-specific heart surgery procedure codes (2P):

3834 AORTA RESECTION & ANAST

3835 THOR VESSEL RESECT/ANAST

3844 RESECT ABDM AORTA W REPL

3845 RESECT THORAC VES W REPL

3864 EXCISION OF AORTA

3865 THORACIC VESSEL EXCISION

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3949 VASC PROC REVISION NEC

3956 REPAIR VESS W TIS PATCH

3957 REP VESS W SYNTH PATCH

3958 REPAIR VESS W PATCH NOS

3959 REPAIR OF VESSEL NEC

ICD-9-CM Congenital heart disease diagnosis codes (2D)1:

7450 COMMON TRUNCUS

74510 COMPL TRANSPOS GREAT VES

74511 DOUBLE OUTLET RT VENTRIC

74512 CORRECT TRANSPOS GRT VES

74519 TRANSPOS GREAT VESS NEC

7452 TETRALOGY OF FALLOT

7453 COMMON VENTRICLE

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

74560 ENDOCARD CUSHION DEF NOS

74561 OSTIUM PRIMUM DEFECT

74569 ENDOCARD CUSHION DEF NEC

7457 COR BILOCULARE

7458 SEPTAL CLOSURE ANOM NEC

7459 SEPTAL CLOSURE ANOM NOS

74600 PULMONARY VALVE ANOM NOS

74601 CONG PULMON VALV ATRESIA
74602 CONG PULMON VALVE STENOS
74609 PULMONARY VALVE ANOM NEC
7461 CONG TRICUSP ATRES/STEN
7462 EBSTEIN'S ANOMALY
7463 CONG AORTA VALV STENOSIS
7464 CONG AORTA VALV INSUFFIC
7465 CONGEN MITRAL STENOSIS
7466 CONG MITRAL INSUFFICIENC
7467 HYPOPLAS LEFT HEART SYND
74681 CONG SUBAORTIC STENOSIS
74682 COR TRIATRIATUM
74683 INFUNDIB PULMON STENOSIS
74684 OBSTRUCT HEART ANOM NEC
74685 CORONARY ARTERY ANOMALY
74687 MALPOSITION OF HEART
74689 CONG HEART ANOMALY NEC
7469 CONG HEART ANOMALY NOS
7470 PATENT DUCTUS ARTERIOSUS
74710 COARCTATION OF AORTA
74711 INTERRUPT OF AORTIC ARCH
74720 CONG ANOM OF AORTA NOS
74721 ANOMALIES OF AORTIC ARCH
74722 AORTIC ATRESIA/STENOSIS
74729 CONG ANOM OF AORTA NEC
7473 PULMONARY ARTERY ANOM
74731 PULMON ART COARCT/ATRES
74732 PULMONARY AV MALFORMATN
74739 OTH ANOM PUL ARTERY/CIRC
74740 GREAT VEIN ANOMALY NOS
74741 TOT ANOM PULM VEN CONNEC
74742 PART ANOM PULM VEN CONN
74749 GREAT VEIN ANOMALY NEC

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

Exclusions

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Exclude cases:

• with any-listed ICD-9-CM procedure codes for closed heart valvotomy (3AP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal enlargement (3BP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair (3CP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for ventricular septal defect repair (3DP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for other surgical occlusion (3FP) as the only congenital heart disease procedure and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with patent ductus arteriosus (PDA)† and any-listed ICD-9-CM procedure codes for catheterization (6P) without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for atrial septal defect repair and enlargement (4P) as the only congenital heart disease procedure without any-listed ICD-9-CM procedure codes for extracorporeal circulation (5P)

• with any-listed ICD-9-CM procedure codes for heart transplant (7P)

• with any-listed ICD-9-CM diagnosis codes for premature infant (4D) and PDA†

• with any-listed ICD-9-CM diagnosis codes for atrial septal defect or ventricular septal defect (5D) and PDA†

• age less than or equal to 30 days with PDA†

• transferring to another short-term hospital (DISP=2)

• neonates with birth weight less than 500 grams (Birth Weight Category 1)

• MDC 14 (pregnancy, childbirth and pueperium)

• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

† PDA is defined as any-listed ICD-9-CM diagnosis code for PDA† closure (3D) as the only congenital heart disease diagnosis code besides atrial septal defect or ventricular septal defect (5D), and any-listed ICD-9-CM procedure code for occlusion of thoracic vessel (3EP) as the only congenital heart disease procedure code.

See Pediatric Quality Indicators Appendices:

- Appendix I – Definitions of Neonate, Newborn, Normal Newborn, and Outborn
- Appendix L- Low Birth Weight Categories

Exclusion Details

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

N/A

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

ICD-9-CM Closed heart valvotomy procedure codes (3AP):

3500 CLOSED VALVOTOMY NOS

3501 CLOSED AORTIC VALVOTOMY

3502 CLOSED MITRAL VALVOTOMY

3503 CLOSED PULMON VALVOTOMY

3504 CLOSED TRICUSP VALVOTOMY

ICD-9-CM Atrial septal enlargement procedure codes (3BP):

3541 ENLARGE EXISTING SEP DEF

3542 CREATE SEPTAL DEFECT

ICD-9-CM Atrial septal defect repair procedure codes (3CP):

3551 PROS REP ATRIAL DEF-OPN

3571 ATRIA SEPTA DEF REP NEC

ICD-9-CM Ventricular septal defect repair procedure codes (3DP):

3553 PROS REP VENTRIC DEF-OPN

3572 VENTR SEPTA DEF REP NEC

ICD-9-CM Occlusion of thoracic vessel procedure codes (3EP):

3885 OCCLUDE THORACIC VES NEC

ICD-9-CM PDA closure diagnosis code (3D):

7470 PATENT DUCTUS ARTERIOSUS

ICD-9-CM Other surgical occlusion procedure codes (3FP):

3884 OCCLUDE AORTA NEC

3885 OCCLUDE THORACIC VES NEC

3959 REPAIR OF VESSEL NEC

ICD-9-CM Atrial septal defect repair and enlargement procedure codes (4P):

3541 ENLARGE EXISTING SEP DEF

3552 PROS REPAIR ATRIA DEF-CL

ICD-9-CM Extracorporeal circulation procedure code (5P):

3961 EXTRACORPOREAL CIRCULAT

ICD-9-CM Atrial septal defect or ventricular septal defect diagnosis codes (5D):

7454 VENTRICULAR SEPT DEFECT

7455 SECUNDUM ATRIAL SEPT DEF

ICD-9-CM Catheterization procedure codes (6P):

3721 RT HEART CARDIAC CATH

3722 LEFT HEART CARDIAC CATH

3723 RT/LEFT HEART CARD CATH

8842 CONTRAST AORTOGRAM

8843 CONTR PULMON ARTERIOGRAM

8844 CONTR THOR ARTERIOGR NEC

8850 ANGIOCARDIOGRAPHY NOS

8851 VENA CAV ANGIOCARDIOGRAM

8852 RT HEART ANGIOCARDIOGRAM

8853 LT HEART ANGIOCARDIOGRAM

8854 RT & LT HEART ANGIOCARD

8855 CORONAR ARTERIOGR-1 CATH

8856 CORONAR ARTERIOGR-2 CATH

8857 CORONARY ARTERIOGRAM NEC

8858 NEGATVE-CONTR CARDIOGRAM

ICD-9-CM Heart transplant procedure codes (7P)1:

375 HEART TRANSPLANTATION

3751 HEART TRANSPLANTATION

3752 IMP TOT INT BI HT RP SYS

1 The procedure or diagnosis codes are continuously updated. The current list of ICD-9-CM codes is valid for October 2012 through September 2013. Italicized codes are not active in Fiscal Year 2013.

ICD-9-CM Premature infant diagnosis codes (4D):

76500 EXTREME IMMATUR WTNOS

76501 EXTREME IMMATUR <500G

76502 EXTREME IMMATUR 500-749G

76503 EXTREME IMMATUR 750-999G

76504 EXTREME IMMAT 1000-1249G

76505 EXTREME IMMAT 1250-1499G

76506 EXTREME IMMAT 1500-1749G

76507 EXTREME IMMAT 1750-1999G

76508 EXTREME IMMAT 2000-2499G

76509 EXTREME IMMAT 2500+G

76510 PRETERM INFANT NEC WTNOS

76511 PRETERM NEC <500G

76512 PRETERM NEC 500-749G

76513 PRETERM NEC 750-999G

76514 PRETERM NEC 1000-1249G

76515 PRETERM NEC 1250-1499G

76516 PRETERM NEC 1500-1749G

76517 PRETERM NEC 1750-1999G

76518 PRETERM NEC 2000-2499G

76519 PRETERM NEC 2500+G

Risk Adjustment

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Stratification by risk category/subgroup

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Statistical risk model

Stratification

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Please see Appendix

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.

Type Score

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Rate/proportion better quality = lower score

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

Rate/proportion better quality = lower score

Algorithm

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

Please refer to numerator and denominator sections as well as the attachments for detailed information.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each

indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.

Submission items

0733 Operative Mortality Stratified by the 5 STAT Mortality Categories

5.1 Identified measures: 0339 : RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: Measure 0339 is based on administrative data while the STS measure is based on clinical registry data.

5b.1 If competing, why superior or rationale for additive value: Differences between Clinical and Administrative Nomenclature –

Several studies have examined the relative utility of clinical and administrative nomenclature for the evaluation of quality of care for patients undergoing treatment for pediatric and congenital cardiac disease. Evidence from four recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via ICD-9 as used currently in administrative databases in the United States is poor [1, 2, 3, 4].

First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators reported that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the ICD-9 in the hospital discharge database [1]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using ICD-9. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from ICD-9 [2]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the United States government carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [3]. These records were reviewed and classified using both administrative coding and the clinical nomenclature used in The Society of Thoracic Surgeons Congenital Heart Surgery Database. This study concluded that analyses based on the codes available in ICD-9 are likely to "have substantial misclassification" of congenital cardiac disease. Fourth, a study was performed using linked patient data (2004-2010) from The Society of Thoracic Surgeons Congenital Heart Surgery (STS-CHS) Database (clinical registry) and the Pediatric Health Information Systems (PHIS) database (administrative database) from hospitals participating in both in order to evaluate differential coding/classification of operations between datasets and subsequent impact on outcomes assessment [4]. The cohort included 59,820 patients from 33 centers. There was a greater than 10% difference in the number of cases identified between data sources for half of the benchmark operations. The negative predictive value (NPV) of the administrative (versus clinical) data was high (98.8%-99.9%); the positive predictive value (PPV) was lower (56.7%-88.0%). Overall agreement between data sources in RACHS-1 category assignment was 68.4%. These differences translated into significant differences in outcomes assessment, ranging from an underestimation of mortality associated with truncus arteriosus repair by 25.7% in the administrative versus clinical data (7.01% versus 9.43%; p = 0.001) to an overestimation of mortality associated with ventricular septal defect (VSD) repair by 31.0% (0.78% versus 0.60%; p = 0.1). For the RACHS-1 categories, these ranged from an underestimation of category 5 mortality by 40.5% to an overestimation of

category 2 mortality by 12.1%; these differences were not statistically significant. This study demonstrates differences in case ascertainment between administrative and clinical registry data for children undergoing cardiac operations, which translated into important differences in outcomes assessment.

Several potential reasons can explain the poor diagnostic accuracy of administrative databases and codes from ICD-9:

- accidental miscoding
- coding performed by medical records clerks who have never seen the actual patient
- contradictory or poorly described information in the medical record
- lack of diagnostic specificity for congenital cardiac disease in the codes of ICD-9
- inadequately trained medical coders.

Although one might anticipate some improvement in diagnostic specificity with the planned adoption of ICD-10 by the US, it is likely to still be far short from that currently achieved with clinical registries. (ICD-9 has only 29 congenital cardiac codes and ICD-10 has 73 possible congenital cardiac terms.)

References

1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. Birth Defects Res A Clin Mol Teratol 2003;67:597-603.

2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. J Perinatol 2005;25:737-42.

3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). Cardiology in the Young. 2008 Dec 9; 18(Suppl 2):92–100.

4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. Ann Thorac Surg. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.

0339 RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)

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: No competing measures found.

Related Measures: Pediatric Heart Surgery Volume (PDI 7) NQF #0340

Comparison of NQF 0734, NQF 0113, and NQF 0456

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

0113 Participation in a Systematic Database for Cardiac Surgery

0456 Participation in a Systematic National Database for General Thoracic Surgery

Steward

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

The Society of Thoracic Surgeons

0113 Participation in a Systematic Database for Cardiac Surgery

STS Quality Measurement Task Force. Roster available upon request.

0456 Participation in a Systematic National Database for General Thoracic Surgery

The Society of Thoracic Surgeons

Description

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Participation in at least one multi-center, standardized data collection and feedback program for pediatric and congenital heart surgery that provides benchmarking of the physician's data relative to national and regional programs and uses process and outcome measures.

0113 Participation in a Systematic Database for Cardiac Surgery

Surgery : Cardiac Surgery, Surgery

0456 Participation in a Systematic National Database for General Thoracic Surgery

Participation in a multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures.

Type

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Structure

0113 Participation in a Systematic Database for Cardiac Surgery

Participation in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data

0456 Participation in a Systematic National Database for General Thoracic Surgery

Structure

Data Source

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Registry Data STS Congenital Heart Surgery Database Version 3.22

Available at measure-specific web page URL identified in S.1 No data dictionary

0113 Participation in a Systematic Database for Cardiac Surgery

Registry STS Adult Cardiac Surgery Database – Version 2.73; STS Adult Cardiac Surgery Database Version 2.8 will go live on July 1, 2014.

Available at measure-specific web page URL identified in S.1 Does the facility participate in a clinical database with broad state, regional, or national representation, that provides regular performance reports based on benchmarked data? (y/n) 12 months

0456 Participation in a Systematic National Database for General Thoracic Surgery

Registry Data STS General Thoracic Surgery Database – Version 2.2

Available at measure-specific web page URL identified in S.1 No data dictionary

Level

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Clinician : Group/Practice, Other

0113 Participation in a Systematic Database for Cardiac Surgery

Facility, Clinician : Group/Practice, Other

0456 Participation in a Systematic National Database for General Thoracic Surgery

Clinician : Group/Practice

Setting

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Inpatient/Hospital

0113 Participation in a Systematic Database for Cardiac Surgery

Hospital

0456 Participation in a Systematic National Database for General Thoracic Surgery

Inpatient/Hospital

Numerator Statement

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Whether or not there is participation in at least one multi-center data collection and feedback program for pediatric and congenital heart surgery.

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0456 Participation in a Systematic National Database for General Thoracic Surgery

Whether or not the physician participates for a 12-month period in at least one multi-center data collection and feedback program that provides benchmarking of the physician's data relative to national programs and uses structural, process, and outcome measures

Numerator Details

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Participation is defined as submission of all congenital and pediatric operations performed to the database.

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0456 Participation in a Systematic National Database for General Thoracic Surgery

Participation in the STS General Thoracic Surgery Database is initiated by the surgeons and or/hospital and requires semiannual submission via an approved software system to the Duke Clinical Research Institute (DCRI), the data repository for the three STS Databases. The General Thoracic Surgery Database accepts data from General Surgeons performing Thoracic procedures as well as Thoracic Surgeons.

Denominator Statement

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

No risk adjustment or risk stratification

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

Denominator Details

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

Exclusions

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

Exclusion Details

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

Risk Adjustment

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

No risk adjustment or risk stratification

0113 Participation in a Systematic Database for Cardiac Surgery

Categorical

0456 Participation in a Systematic National Database for General Thoracic Surgery

No risk adjustment or risk stratification

Stratification

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

N/A

0113 Participation in a Systematic Database for Cardiac Surgery

0456 Participation in a Systematic National Database for General Thoracic Surgery

N/A

Type Score

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

Categorical, e.g., yes/no passing score defines better quality

0113 Participation in a Systematic Database for Cardiac Surgery

passing score defines better quality N/A No diagram provided

0456 Participation in a Systematic National Database for General Thoracic Surgery

Categorical, e.g., yes/no passing score defines better quality

Algorithm

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

See S.4 - S.5

0113 Participation in a Systematic Database for Cardiac Surgery

N/A

0456 Participation in a Systematic National Database for General Thoracic Surgery

See S.4 - S.5

Submission items

0734 Participation in a National Database for Pediatric and Congenital Heart Surgery

5.1 Identified measures: 0456 : Participation in a Systematic National Database for General Thoracic Surgery

0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures

0113 : Participation in a Systematic Database for Cardiac Surgery

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0456 (both STS) are for different patient and surgical case populations

5b.1 If competing, why superior or rationale for additive value:

0113 Participation in a Systematic Database for Cardiac Surgery

5.1 Identified measures:

5a.1 Are specs completely harmonized?

5a.2 If not completely harmonized, identify difference, rationale, impact: The Society of Thoracic Surgeons

5b.1 If competing, why superior or rationale for additive value: Mark | Antman | mantman@sts.org | 312-202-5856-

0456 Participation in a Systematic National Database for General Thoracic Surgery

5.1 Identified measures: 0493 : Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures

0113 : Participation in a Systematic Database for Cardiac Surgery

0734 : Participation in a National Database for Pediatric and Congenital Heart Surgery

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact: 0113 and 0734 (both STS) are for different patient and surgical case populations

5b.1 If competing, why superior or rationale for additive value:

Comparison of NQF 3493, NQF 1550, and NQF 1551

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups
1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)
1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Steward

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Centers for Medicare & Medicaid Services

Description

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

This measure is a re-specified version of the measure, "Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)" (NQF 1550), which was developed for patients 65 years and older using Medicare claims data. This re-specified measure attributes outcomes to MIPS participating Eligible Clinicians and/or Eligible Clinician Groups ("providers"), rather than to hospitals, and assesses each provider's complication rate, 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).

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.

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure estimates a hospital-level, 30-day RSRR following elective primary THA and/or TKA. The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission. A specified set of planned readmissions do not count as readmissions. 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.

Type

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Outcome

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Outcome

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Outcome

Data Source

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Claims, Enrollment Data Medicare administrative claims and enrollment data

No data collection instrument provided Attachment Del18eHOP5MIPSHKCDataDictionary121718-636824515108939830.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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) 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 testing 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).

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:

3. California Patient Discharge Data in addition to CMS Medicare FFS data for patients in California hospitals. Using all-payer data from California, we performed analyses to determine whether the THA/TKA readmission 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 the analysis of the impact of SES variables on the measure's risk model. Note that the variables derived from these data are not included in the measure as specified

4. 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.

Dorsey K, Grady J, Desai N, et al. 2016 Procedure-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Readmission Measures: Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) & Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) (Version 5.0). 2016

No data collection instrument provided Attachment NQF_1551_HKR__Data_Dictionary_v0.1_Final-636564636360815509.xls

Level

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Clinician : Group/Practice, Clinician : Individual

1550 Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Facility

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Facility

Setting

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Inpatient/Hospital, Other Hospital: Acute Care Facility

Numerator Statement

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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 other than mortality are counted in the measure only if they occur during the index hospital admission or during a readmission. This outcome is identical to that of the original hospital measure. Additional details are provided in S.5 Numerator Details.

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".

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The outcome for this 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 of the index hospitalization. If a patient has more than one unplanned admissions (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.

Numerator Details

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Outcome Definition

The composite complication is a dichotomous outcome (yes for any complication(s); no for no complications) occurring within 90 days post-date of the index admission. Therefore, if a patient experiences one or more complications, the outcome variable will get coded as a "yes." The measure includes the following surgical complications: surgical site bleeding, mechanical complications, periprosthetic joint infection/wound infection; and also includes death as a complication. The measure also includes the following medical complications, as they are important in measuring overall quality: acute myocardial infarction (AMI), pneumonia, pulmonary embolism, and sepsis/septicemia/shock. 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. This outcome definition is identical to the Hospital-level RSCR following elective primary THA and/or TKA" (NQF 1550).

The measure assesses a dichotomous yes or no outcome of whether each admitted patient experiences one or more of the complications defined below. Complications other than mortality are counted in the measure only if they occur during the index admission or require a readmission. The measure does not count complications that occur in the outpatient setting and do not require a readmission. The outcome is aligned with CMS's hospital-level THA/TKA complication measure.

The measure defines a "complication" as:

• Acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia/shock during the index admission or a subsequent inpatient admission that occurs within 7 days from the start of the index admission;

• Surgical site bleeding or pulmonary embolism during the index admission or a subsequent inpatient admission within 30 days from the start of the index admission;

• Death during the index admission or within 30 days from the start of the index admission;

• Mechanical complication or periprosthetic joint infection/wound infection during the index admission or a subsequent inpatient admission that occurs within 90 days from the start of the index admission. (See attached Data Dictionary for list of ICD-9 and 10 codes used to define complications).

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.

For the full list of ICD-9 and ICD-10 codes defining complications, see the Data Dictionary attached in field S.2b., sheets HK Complications I10-Outcome" and "Complication Codes ICD9."

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".

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Outcome Definition

The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of discharge of the index THA and/or TKA hospitalization, 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 (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. In applying the algorithm to condition- and procedure-specific measures, teams of clinical experts reviewed the algorithm in the context of each measure-specific patient cohort and, where clinically indicated, adapted the content of the algorithm to better reflect the likely clinical experience of each measure's patient cohort. For the THA/TKA readmission measure, CMS used the Planned Readmission Algorithm without making any changes.

For more details on the Planned Readmission Algorithm, please see the report titled "2017 Procedure-Specific Measures Updates and Specifications Report Hospital-Level 30-Day

Risk-Standardized Readmission Measures, Version 6.0" posted in the webpage provided in data field S.1.

Denominator Statement

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

The target population for the measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age who have undergone elective primary THA and/or TKA procedures.

Attribution of Index Admissions to Eligible Clinicians

Each patient index admission (the admission during which the patient has the eligible THA/TKA procedure), and therefore their outcome (complication or no complication) is attributed to the Eligible Clinician who bills for the procedure (Billing Surgeon). Conceptually, the Billing Surgeon is the Clinician with the primary responsibility for the procedure and procedure related care.

In practice, patients may have different claims for the same procedure, and so the billing surgeon is assigned through an algorithm that resolves ambiguities in billing. The algorithm uses billing claims to identify the clinician(s) who bills for a THA (CPT® code 27130) or TKA (CPT®® code 27447 or CPT® code 27446) (steps 1-3 below). These CPT® codes are representative of the THA and/or TKA procedures included in the measure cohort.

1. If only one clinician bills for a THA (CPT® code 27130) or TKA (CPT® code 27446 or 27447) for a patient, the algorithm identifies and assigns this individual as the Billing Surgeon.

2. If two or more clinicians bill for THA/TKA procedures (CPT® 27130, 27447, or 27446), the algorithm seeks to identify a 'key' physician among them. The algorithm identifies and excludes assignment to clinicians who were assistants-at-surgery (assistant surgeon with CPT® modifier 80 or 82, minimum assistant surgeon with CPT® modifier 81). In this step, the algorithm assigns the Billing Surgeon as the clinician who billed for a THA or TKA procedure and is not an assistant-at-surgery.

3. If a single clinician who is not an assistant-at-surgery could not be identified for assignment, then the algorithm identifies whether there is a single clinician who was an orthopedic surgeon (Medicare Specialty Code 20) and assigns this as the Billing Surgeon.

4. If the algorithm cannot identify a Billing Surgeon, it identifies whether an Operator is listed on the institutional claim. The algorithm then defaults assignment to the Operator listed on the institutional claim.

Finally, if a Billing Surgeon or Operator cannot be identified with the steps above, the patient is not assigned to a clinician or group and is excluded from the measure.

Attribution of Index Admissions to an Eligible Clinician Group

CMS needs the flexibility to assign each eligible patient index admission to at least one Eligible Clinician and at least one Eligible Clinician group. This allows them the ability to report at either the Eligible Clinician or the Eligible Clinician Group level. Conceptually, these assignments should represent a consistent group of clinicians. That is, it would be confusing to assign a patient to Eligible Clinician A and also to Eligible Clinician Group B if

Eligible Clinician A is not in that Group. The attribution methodology addresses this by using both individual and group identifiers.

Every Medicare Eligible Clinician has a unique National Provider Identifier (NPI). Similarly, every Medicare Eligible Clinician Group has one or more Tax Identification Numbers (TINs), reflecting their practice setting(s). Each Eligible Clinician claim should include both their NPI and a TIN which identifies their "group" (which may consist only of that clinician if they are solo providers). Therefore, we identify clinicians for each patient index admission through the unique National Provider ID (NPI) and Tax ID (TIN) combination listed on a patient's claim. For a Billing Surgeon, the NPI and TIN are those on the procedure claim used to attribute the patient index admission. To identify the unique TIN/NPI combination for the Operator, the Operator's NPI is matched to the TIN with the most Part B allowed charges during the index admission or during the measurement year if the Operator did not bill during the index admission. Most NPIs are associated with only one TIN. A Clinician Group is set of Clinicians (NPI-TIN combinations) assigned to the same TIN.

Additional details are provided in S.7 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.

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The target population for the publicly 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.7 Denominator Details.

Denominator Details

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

To be included in the measure cohort used, 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 and for 90 days after discharge;

2. Aged 65 or older; and

3. Having a qualifying elective primary THA/TKA procedure.

Elective primary THA/TKA procedures are defined as those procedures without any of the following:

1. Femur, hip, or pelvic fractures coded in the principal or secondary discharge diagnosis field of the index admission

2. 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

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

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.

Elective primary THA/TKA procedures are defined as those procedures without any of the 8 associated conditions or finding noted above.

For a full list of ICD-9 and ICD-10 codes defining the following see attached Data Dictionary, sheets “I-10 Cohort Codes” and “I9 Cohort Codes.”

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)

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:

0SR90J9 Replacement of Right Hip Joint with Synthetic Substitute, Cemented, Open Approach

0SR90JA Replacement of Right Hip Joint with Synthetic Substitute, Uncemented, Open Approach

0SR90JZ Replacement of Right Hip Joint with Synthetic Substitute, Open Approach

0SRB0J9 Replacement of Left Hip Joint with Synthetic Substitute, Cemented, Open Approach

0SRB0JA Replacement of Left Hip Joint with Synthetic Substitute, Uncemented, Open Approach

0SRB0JZReplacement of Left Hip Joint with Synthetic Substitute, Open Approach

0SRC07Z Replacement of Right Knee Joint with Autologous Tissue Substitute, Open Approach

0SRC0JZReplacement of Right Knee Joint with Synthetic Substitute, Open Approach

0SRC0KZ Replacement of Right Knee Joint with Nonautologous Tissue Substitute, Open Approach

0SRD07Z Replacement of Left Knee Joint with Autologous Tissue Substitute, Open Approach

0SRD0JZ Replacement of Left Knee Joint with Synthetic Substitute, Open Approach

0SRD0KZReplacement of Left Knee Joint with Nonautologous Tissue Substitute, Open Approach

0SRT07Z Replacement of Right Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

0SRT0JZ Replacement of Right Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

0SRT0KZ Replacement of Right Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

0SRU07Z Replacement of Left Knee Joint, Femoral Surface with Autologous Tissue Substitute, Open Approach

0SRU0JZ Replacement of Left Knee Joint, Femoral Surface with Synthetic Substitute, Open Approach

0SRU0KZ Replacement of Left Knee Joint, Femoral Surface with Nonautologous Tissue Substitute, Open Approach

0SRV07Z Replacement of Right Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

0SRV0JZ Replacement of Right Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

0SRV0KZ Replacement of Right Knee Joint, Tibial Surface with Nonautologous Tissue Substitute, Open Approach

0SRW07Z Replacement of Left Knee Joint, Tibial Surface with Autologous Tissue Substitute, Open Approach

0SRW0JZ Replacement of Left Knee Joint, Tibial Surface with Synthetic Substitute, Open Approach

0SRW0KZ 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.”

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) 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 FFS Part A and Part B Medicare for the 12 months prior to the date of admission; and enrolled in Part A during the index admission;

2. Aged 65 or over;

3. Discharged alive from a non-federal acute care hospital; and,

4. Have a qualifying elective primary THA/TKA procedure; elective primary THA/TKA procedures are defined as those procedures without any of the following:

o Fracture of the pelvis or lower limbs coded in the principal or secondary discharge diagnosis fields of the index admission;

o A concurrent partial hip arthroplasty procedure;

o A concurrent revision, resurfacing, or implanted device/prosthesis removal procedure;

o Mechanical complication coded in the principal discharge diagnosis field;

o 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; or,

o Transfer from another acute care facility for the THA/TKA

ICD-9 and ICD-10 cohort codes are included in the attached Data Dictionary.

Exclusions

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

This measure excludes index admissions for patients:

1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge;

2. Who were transferred in to the index hospital;

3. Who leave the hospital against medical advice (AMA);

4. With more than two THA/TKA procedures codes during the index hospitalization; or

5. Who cannot be attributed to a billing surgeon or operator using claims data

After applying the exclusion criteria above, 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.

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.

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This Hip/knee readmission measure excludes admissions for patients:

1) Without at least 30 days post-discharge enrollment in Medicare FFS;

2) Discharged against medical advice;

3) Admitted for the index procedure and subsequently transferred to another acute care facility;

4) Who had more than two THA/TKA procedure codes during the index hospitalization; or

5) Who had THA/TKA admissions within 30 days of a prior THA/TKA index admission.

Exclusion Details

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

The measure excludes admissions for patients:

1. Who survived the index admission but without 90-day Medicare part A enrollment post discharge

Rationale: Only patients with adequate claims data for attribution should be included in risk-adjustment model and the measure.

2. Who were transferred in to the index hospital

Rationale: If the patient is transferred from another acute care facility to the hospital where the index procedure occurs, it is likely that the procedure is not elective, or that the admission is associated with an acute condition.

3. Who leave the hospital against medical advice (AMA)

Rationale: Clinicians have limited opportunity to implement high quality care.

4. With more than two THA/TKA procedures 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, and this may reflect a coding error.

5. Who cannot be attributed to a billing surgeon or operator using claims data

Rationale: Only patients with adequate clinician claims for attribution should be included in risk-adjustment model and the measure.

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.

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

This measure excludes index admissions for patients:

1. Without at least 30 days of post-discharge enrollment in Medicare FFS as determined by examining the Medicare Enrollment Database (EDB).

Rationale: The 30-day readmission outcome cannot be assessed in this group since claims data are used to determine whether a patient was readmitted.

2. Discharged against medical advice, which are identified by examining the discharge destination indicator in claims data.

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. Admitted for the index procedure and subsequently transferred to another acute care facility as identified in claims data, which are defined as when a patient with an inpatient hospital admission (with at least one qualifying THA/TKA procedure) is discharged from an acute care hospital and admitted to another acute care hospital on the same or next day.

Risk Adjustment

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Statistical risk model

Stratification

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

N/A

Type Score

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

Rate/proportion better quality = lower score

Algorithm

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

In Dataset April 2013 to March 2016 (prior to exclusions being applied): We started with the hospital HKC measure cohort, with an initial index cohort size of 982,436 index admissions with an elective primary THA/TKA procedure. After applying exclusion criteria 1 through 4 listed in the table below, we have a cohort sample size of 935,029 index admissions. Our previous NQF filing for hospital HKC showed no bias introduced through the exclusion process for hospitals for this same cohort of 935,029 index admissions. We then further excluded 10,243 (1.0%) index admissions (criteria 5 and 6 below) which cannot be attributed to physician/physician group to create our final measure cohort.

The measure estimates eligible clinician or clinician group ("provider")-level RSCRs following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and provider 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 provider-specific intercept. At the provider level, it models the provider-specific intercepts as arising from a normal distribution. The provider intercept represents the underlying risk of a complication for patients treated by the provider, after accounting for patient risk. The provider-specific intercepts are given a distribution to account for the clustering (non-independence) of patients treated by the same provider. If there were no differences among providers, then after adjusting for patient risk, the provider intercepts should be identical across all providers.

The RSCR is calculated as the ratio of the number of "predicted" to the number of "expected" admissions with a complication at a given provider, multiplied by the national observed complication rate. The "predicted" number of admissions with a complication (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the provider-specific intercept on the risk of having an admission with a complication. The estimated provider-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 provider 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 providers in our sample is added in place of the provider-specific effect. The results are log transformed and summed over all patients in the provider to get an expected value. To assess provider performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

For each provider, the numerator of the ratio is the number of complications within 90 days predicted on the basis of the provider's performance with its observed case mix, and the denominator is the number of complications expected based on the nation's performance with that provider'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 provider's performance given its case mix to an average provider'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.

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

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.

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

The measure estimates hospital-level 30-day all-cause RSRRs 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 readmission 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 a readmission 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 after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSRR is calculated as the ratio of the number of “predicted” to the number of “expected” readmission at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted on the basis of the hospital’s performance with its observed case mix, and the denominator is the number of readmissions 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 readmission rates or better quality, and a higher ratio indicates higher-than-expected readmission rates or worse quality.

The “predicted” number of readmissions (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of readmission. 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 readmissions (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 readmission 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 30-Day All-Cause Risk-Standardized Readmission 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.

Submission items

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: The measure is fully harmonized with NQF #1550 regarding cohort definition, outcome, and risk adjustment approach. The only discrepancy is the attribution approach, which assigns each index admission to a clinician rather than a hospital, and the exclusion of patients for which no billing surgeon or operator can be identified.

5b.1 If competing, why superior or rationale for additive value: Clinicians, particularly the surgeon performing the procedure, can influence the outcome of surgery for better or worse, both through their technical skill and through their influence on the care team and hospital safety culture. Therefore, many of the strategies and best practices used by hospitals to reduce the risk of complications can also be adopted by individual clinicians and groups of clinicians to improve patient outcomes. Further evidence of surgeons' influence are data indicating that increasing surgeon volume is associated with reductions in adverse surgical outcomes (Battaglia TC et al., 2006; Shervin et al., 2007).

The THA/TKA risk-standardized complication rate (RSCR) measure for clinicians is thus intended to inform quality-of-care improvement efforts, as individual process-based performance measures cannot encompass all the complex and critical aspects of care that contribute to patient outcomes. It also complements the hospital measure as a proportion of surgeons have very different performance quality than the institutions in which they perform surgery; this measure provides a transparent reflection of these discordances to further support quality improvement.

References:

Battaglia TC, Mulhall KJ, Brown TE, Saleh KJ. Increased surgical volume is associated with lower THA dislocation rates. Clin Orthop Relat Res. 2006 Jun;447:28-33.

Shervin N, Rubash HE, Katz JN. Orthopaedic procedure volume and patient outcomes: a systematic literature review. Clin Orthop Relat Res. 2007 Apr;457:35-41.

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

1551 Hospital-level 30-day risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

5.1 Identified measures: 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

1550 : Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)

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

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

Comparison of NQF 3494, NQF 0230, NQF 0119, NQF 2515, and NQF 2558

3494 Hospital 90-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
0119 Risk-Adjusted Operative Mortality for CABG
2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery
2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Steward

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

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)

0119 Risk-Adjusted Operative Mortality for CABG

The Society of Thoracic Surgeons

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

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2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Centers for Medicare & Medicaid Services

Description

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

This measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients 65 years and older discharged from the hospital following a qualifying isolated CABG procedure. Mortality is defined as death from any cause within 90 days of the procedure date of an index CABG admission. The measure was developed using Medicare Fee-for-Service (FFS) patients 65 years and older. An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the mortality outcome. This measure may be used in one or more to be defined 90-day payment models.

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-for-service (FFS) beneficiaries hospitalized in non-federal hospitals or patients hospitalized in Veterans Health Administration (VA) facilities.

0119 Risk-Adjusted Operative Mortality for CABG

Percent of patients aged 18 years and older undergoing isolated CABG who die, including both 1) all deaths occurring during the hospitalization in which the CABG was performed, even if after 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

The measure estimates a hospital-level risk-standardized readmission rate (RSRR), defined as unplanned readmission for any cause within 30 days from the date of discharge of the index CABG procedure, for patients 18 years and older discharged from the hospital after undergoing a qualifying isolated CABG procedure. 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.

An index admission is the hospitalization for a qualifying isolated CABG procedure considered for the readmission outcome.

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.

Type

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

Outcome

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

Outcome

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Outcome

Data Source

3494 Hospital 90-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 (2009-2013): We examined disparities in performance according to the proportion of patients in each hospital who were dual eligible for both Medicare and Medicaid insurances. We also used the Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status (SES) index score derived from the American Community Survey (2009-2013) to study the association between our measure and SES.

Master Beneficiary Summary File (MBSF)

The MBSF is an annually created file that contains enrollment information for all Medicare beneficiaries, including dual eligible status. Years 2014-2017 were used.

The Society of Thoracic Surgeons (STS) CABG Composite Online Star Ratings

Empiric validity testing was performed using the publicly available measure score of the Society of Thoracic Surgery (STS) CABG Composite Online Star Rating, which combines several measures across quality domains to score hospitals from one (low quality) to three (high quality) stars (The Society of Thoracic Surgeons, 2017).

References

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.

The Society of Thoracic Surgeons. STS Public Reporting Online. CABG Overall Composite Score. 2017. Available at:https://publicreporting.sts.org/search/cabg_report_card/hospital?title=&field_year_target_id=11&field_state_value=All. Accessed December 1, 2018.

No data collection instrument provided Attachment Del18gHOP590DayCABGMortalityMeasureDataDictionary01042019-636824525665955768.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

0119 Risk-Adjusted Operative Mortality for CABG

Registry Data STS Adult Cardiac Surgery Database Version 2.81 (effective July 1, 2014); Version 2.9 (effective July 1, 2017)

Available at measure-specific web page URL identified in S.1 Attachment S.15._Isolated_CABG_Risk_Model_Specifications-635307506255634552.doc

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

Facility Inpatient/Hospital

Attachment NQF_2515_CABG_Readmission_Data_Dictionary_01-11-17_v1.0.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

Level

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

Facility, Clinician : Group/Practice

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

N/A. This measure is not a composite performance measure.

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Facility

Setting

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

Inpatient/Hospital

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

NQF_2515_CABG_Readmission_NQF_Evidence_Attachment_01-11-17_v1.0.docx

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Inpatient/Hospital

Numerator Statement

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The outcome for this measure is 90-day all-cause mortality. Mortality is defined as death for any reason within 90 days of the procedure date from the index admission for patients 65 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.

0119 Risk-Adjusted Operative Mortality for CABG

Number of patients undergoing isolated CABG who die, including both 1) all deaths occurring during the hospitalization in which the operation was performed, even if after 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

The index cohort includes admissions for patients aged 18 years or older who received a qualifying "isolated" CABG procedure (CABG procedure without other concurrent major cardiac procedure such as a valve replacement). All patients in the cohort are alive at discharge (i.e., no in-hospital death). The measure was developed in a cohort of patients 65 years and older who were enrolled in Medicare FFS and admitted to non-federal hospitals. To be included in the Medicare FFS cohort, patients had to have a qualifying isolated CABG procedure AND had to be continuously enrolled in Medicare Fee-for-Service (FFS) one year prior to the first day of the index hospitalization and through 30 days post-discharge.

This cohort is defined using the ICD-9 and ICD-10 Clinical Modification procedure codes identified in Medicare Part A Inpatient claims data. The ICD-10 specifications are attached in the Data Dictionary. ICD-9 and ICD-10 procedure codes that indicate a patient has undergone a NON-isolated CABG procedure (CABG surgeries that occur concomitantly with procedures that elevate patients' readmission risk) and thus does not meet criteria for inclusion in the measure cohort are listed in the attached Data Dictionary.

ICD-9-CM codes that define the cohort:

36.10 - Aortocoronary bypass for heart revascularization, not otherwise specified

36.11 - (Aorto) coronary bypass of one coronary artery

36.12 - (Aorto coronary bypass of two coronary arteries

36.13 - (Aorto) coronary bypass of three coronary arteries

36.14 - (Aorto) coronary bypass of four or more coronary arteries

36.15 - Single internal mammary- coronary artery bypass

36.16 - Double internal mammary- coronary artery bypass

36.17 - Abdominal- coronary artery bypass

36.19 - Other bypass anastomosis for heart revascularization

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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

This is an all-cause mortality measure, therefore any death within 90 days of the index procedure date from the index hospitalization is included in the measure outcome. We

identify deaths for Medicare FFS patients 65 years or older using the Medicare Enrollment Database (EDB).

Numerator time window: 90 days from the procedure date of index CABG procedure.

This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define the outcome and to which hospital the outcome is attributed when there are multiple hospitalizations within a single episode of care.

Outcome Attribution:

Attribution of the outcome in situations where a patient has multiple contiguous admissions, at least one of which involves an index CABG procedure (i.e., the patient is either transferred into the hospital that performs the index CABG or is transferred out to another hospital following the index CABG) 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 90-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 90-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 90-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. http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/QnetTier3&cid=1163010421830. Accessed May 4, 2018.

0119 Risk-Adjusted Operative Mortality for CABG

Number of isolated CABG procedures with an operative mortality;

Number of isolated CABG procedures in which Mortality [Mortalty (STS Adult Cardiac Surgery Database Version 2.9)] and Mortality Operative Death (MtOpD) are marked "yes." Operative mortality is further verified by the following variables: Mortality Status at 30 days (Mt30Stat), Mortality Date (MtDate), Mortality Discharge Status (MtDCStat)

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

In order to create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures).

For all cohorts, hospitalizations are excluded if they meet any of the following criteria, for admissions:

1. Without at least 30 days post-discharge enrollment in FFS Medicare
2. Discharged against medical advice (AMA)
3. Admissions for subsequent qualifying CABG procedures during the measurement period

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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

This claims-based measure can be used in the patient cohort aged 65 years or older.

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 the measure 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

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.

0119 Risk-Adjusted Operative Mortality for CABG

All patients undergoing isolated CABG

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

In order to create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures).

For all cohorts, hospitalizations are excluded if they meet any of the following criteria:

1. Without at least 30 days post-discharge enrollment in FFS Medicare

Rationale: The 30-day readmission outcome cannot be assessed in this group since claims data are used to determine whether a patient was readmitted.

2. Discharged against medical advice (AMA)

Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. Admissions for subsequent qualifying CABG procedures during 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 from the cohort.

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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure includes index admissions for patients:

1. Having a qualifying isolated CABG surgery during the index admission;
2. Enrolled in Medicare 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:

- Valve procedures;
- Atrial and/or ventricular septal defects;
- Congenital anomalies;
- Other open cardiac procedures;
- Heart transplants;
- Aorta or other non-cardiac arterial bypass procedures;
- Head, neck, intracranial vascular procedures; or,
- Other chest and thoracic procedures

This cohort is defined using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-09-CM) procedure codes and/or International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-Procedure Coding System [PCS]) procedure codes identified in Medicare Part A Inpatient claims data. To create a clinically coherent population for risk adjustment and in accordance with existing NQF-approved CABG measures and clinical expert opinion, the measure is intended to capture isolated CABG patients (i.e., patients undergoing CABG procedures without concomitant valve or other major cardiac or vascular procedures see exclusion). ICD-09-CM and ICD-10-PCS procedure codes that indicate a patient has undergone a non-isolated CABG procedure (CABG surgeries that occur concomitantly with procedures that elevate patients' mortality risk) and thus does not meet criteria for inclusion in the measure cohort are used to identify such patients for removal from the cohort.

The ICD-09-CM and ICD-10-PCS procedure codes 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.

0119 Risk-Adjusted Operative Mortality for CABG

Number of isolated CABG procedures. The SQL code used to create the function to identify cardiac procedures is provided in the appendix.

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

N/A

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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The 90-day CABG surgery mortality measure excludes index admissions for patients:

1) With inconsistent or unknown vital status or other unreliable data.

2) Who leave the hospital against medical advice (AMA).

3) With qualifying CABG procedures subsequent to another qualifying CABG procedure during the measurement period.

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.

0119 Risk-Adjusted Operative Mortality for CABG

N/A

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

Statistical risk model

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

3494 Hospital 90-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 a 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.

0119 Risk-Adjusted Operative Mortality for CABG

N/A

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

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

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

Statistical risk model

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

better quality = lower score

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Statistical risk model

Stratification

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

N/A

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

Rate/proportion

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

N/A

Type Score

3494 Hospital 90-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

0119 Risk-Adjusted Operative Mortality for CABG

Rate/proportion better quality = lower score

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

We calculate hospital-specific risk-standardized readmission rates (RSRRs). These rates are obtained as the ratio of predicted to expected readmissions, multiplied by the national unadjusted rate. The expected number of readmissions in each hospital is es N/A. This measure is not based on a sample or survey. N/A. This measure is not based on a sample or survey.

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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The measure estimates hospital-level, 90-day, all-cause, RSMRs for CABG surgery using a hierarchical logistic regression model. 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 90 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 90 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 specific hospital's performance, given its case mix, to be compared to an average hospital's performance with the same case mix. Thus, a lower rate indicates lower-than-expected mortality rates

or better quality, while a higher rate 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 90-day CABG mortality measure methodology report (YNHHS/CORE, 2018).

References

Normand S-LT, Shahian DM. 2007. Statistical and clinical aspects of hospital outcomes profiling. Statistical Science 22(2): 206-226.

Yale New Haven Health System/Center for Outcomes Research & Evaluation (YNHHS/CORE). Hospital-Level 90-day All-Cause Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery; Updated Measure Methodology Report. 2018.

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.

0119 Risk-Adjusted Operative Mortality for CABG

Please refer to numerator and denominator sections for detailed information.

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

Claims

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 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

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

5.1 Identified measures:

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact: The target population is isolated CABG patients for the proposed 90-day CABG mortality measure and all of the above measures that have different measure focus but same target population. The clinical cohort exclusions are harmonized to the extent possible given the differences between clinical registry (STS) and administrative claims data. The exclusions are nearly identical to the STS measures' cohort exclusions with the exception of epicardial MAZE procedures; STS excludes these procedures from the registry-based CABG mortality measure cohort because the version of registry data used for measure development did not allow for differentiation of epicardial and open maze procedures. 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 30-day isolated CABG mortality and readmission measures, which utilize the same definition of isolated CABG as this 90-day mortality measure, were validated using clinical registry data (STS Cardiac Surgery Registry data for the readmission measure and

New York State Cardiac Surgery Registry data for the mortality 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: This measure was specifically developed for and may be used in 90-day payment models. It is not intended to replace the 30-day CABG mortality measure in its current programmatic use or public reporting.

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

0119 Risk-Adjusted Operative Mortality for CABG

5.1 Identified measures: 0114 : Risk-Adjusted Postoperative Renal Failure

0115 : Risk-Adjusted Surgical Re-exploration

0116 : Anti-Platelet Medication at Discharge

0117 : Beta Blockade at Discharge

0118 : Anti-Lipid Treatment Discharge

0120 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)

0127 : Preoperative Beta Blockade

0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)

0130 : Risk-Adjusted Deep Sternal Wound Infection

0131 : Risk-Adjusted Stroke/Cerebrovascular Accident

0134 : Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG)

0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery

0121 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement

0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery

1501 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair

1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact:

5b.1 If competing, why superior or rationale for additive value: N/A

2515 Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery

5.1 Identified measures: The proposed CABG readmission measure, which has been developed in close collaboration with STS, has a target population (i.e., isolated CABG patients) that is harmonized with the above measures to the extent possible given the differences between clinical and administrative data. The exclusions are nearly identical to the STS measures' cohort exclusions with the exception of epicardial MAZE procedures; STS excludes these procedures from the registry-based CABG readmission measure cohort because the version of registry data used for measure development did not allow them to differentiate them from open maze procedures. The age range for the proposed CABG readmission and existing NQF-endorsed STS measure cohorts differs; STS measures are specified for age 18 and over, and the proposed CABG readmission measure is currently specified for age 65 and over. However, we have performed testing in patients 18 years and over and determined the measure performs well across all adult patients and payers. The proposed CABG readmission measure is harmonized with the above measures to the extent possible given the different data sources used for development and reporting.

5a.1 Are specs completely harmonized? Attachment

5a.2 If not completely harmonized, identify difference, rationale, impact: CABG_Readmission_MeasureMethodologyReport_02-01-14_Final.pdf

5b.1 If competing, why superior or rationale for additive value: Centers for Medicare & Medicaid Services

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.

Appendix F: Pre-Evaluation Comments

Comments received as of July 2, 2019.

3493 Risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) for Merit-based Incentive Payment System (MIPS) Eligible Clinicians and Eligible Clinician Groups

Submitted by The American Medical Association (AMA)

The American Medication Association (AMA) appreciates the opportunity to comment on this measure. We are concerned that this measure does not meet the NQF Measure Evaluation Criteria, particularly with regards to evidence and scientific acceptability.

The AMA believes that attribution must be determined based on evidence that the accountable unit is able to meaningfully influence the outcome, which aligns with the most recent National Quality Forum (NQF) report, Improving Attribution Models (NQF, 2018). This principle is also aligned with the evidence requirements for outcome measures in the NQF Measure Evaluation Criteria, which requires that there be at least one structure or process that can influence the outcome and this relationship must be demonstrated through empirical evidence. CMS must begin to demonstrate these relationships with the accountable unit prior to implementing this measure in MIPS. Most of the evidence included in the submission was not specifically related to how an individual physician or practice could reduce complication rates in these patients and, as a result, we do not believe that CMS has adequately demonstrated this link for this measure.

The AMA is concerned that the developer has not provided sufficient information on the range of the measure score reliability results, which is needed to understand whether the minimum case number of 25 patients is acceptable. We believe that measures must meet minimum acceptable thresholds of 0.7 for reliability and during the public comment period in December 2018, the range when applying this measure to eligible clinicians with more than 25 admissions was 0.582 – 0.988 and 0.463 – 0.996 for eligible clinician groups (CMS, 2018). We request that the Standing Committee evaluate whether the case minimum of 25 patients is acceptable given the low reliability results.

We were unable to fully assess the validity testing since it appears that the incorrect results from the face validity survey were provided in section 2b1.3. The language within section 2b1.4 outlining how the developer interpreted the results indicates that the measure is still under development, which leads us to question whether we are reviewing a final version of the measure and specifications. Clarification on these items is needed from the developer.

In addition, we noted that the conceptual basis used to explain which social risk factors were tested in Section 2b3.3a relied on the existing hospital version and was not specific to physicians or practices. It is difficult to determine whether additional factors should be considered without this information and we do not believe that it is responsive to NQF criteria requirements.

We also remain concerned that CMS continues to test social risk factors after assessment of clinical and demographic risk factors and it is unclear why this multi-step approach is preferable. On review of the Evaluation of the NQF Trial period for Risk Adjustment for Social Risk Factors report, it is clear that the approaches to testing these data should be revised to strategies such as multi-level models or testing of

social factors prior to clinical factors and that as access to new data becomes available, it may elucidate more differences that are unrelated to factors within a hospital's or physician's control (NQF, 2017). Additional testing is needed to evaluate clinical factors in-conjunction with social risk factors; as opposed to the current approach that prioritizes clinical factors. Even though the c-statistics was not improved and the absolute change of the rates appeared to be small, it would be useful to understand how these shifts could potentially impact the points physicians score in the Quality Category in MIPS and as a result, either positively or negatively impact the overall penalty or incentive they receive and the resources available for those individuals and groups who serve larger numbers of disadvantaged patients.

Given the measure is specifically developed for MIPS, the developer must perform testing that demonstrates how the measure would perform under the MIPS benchmark methodology and Physician Compare Star Ratings since CMS utilizes two different methodologies for ranking and profiling physicians.

In conclusion, CMS must balance the desire to apply these measures to the broadest number of clinicians possible with the unintended consequences of inappropriately attributing measures to physicians for which they cannot meaningfully influence patient outcomes. The AMA requests that the Standing Committee carefully consider the potential misinformation that could be provided to patients and caregivers if the measures do not have a clear evidence base to support attribution of the outcome to a specific physician and could potentially produce scores that are invalid and unreliable.

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Submitted by The American Medical Association (AMA)

The American Medication Association (AMA) appreciates the opportunity to comment on this measure. Below we outline our concerns on whether this measure meets the NQF Measure Evaluation Criteria, particularly scientific acceptability and usability and use.

The AMA is concerned that the minimum reliability score was 0.57 using a minimum of 25 admissions. We believe that measures must meet minimum acceptable thresholds of 0.7 for reliability and the measure would be improved if the minimum number was higher. We request that the Standing Committee evaluate whether the case minimum of 25 patients is acceptable given the low reliability results.

In addition, CMS must expand the types of social risk factors tested in these risk adjustment models beyond dual eligibility status and the AHRQ SES Index and the conceptual basis supporting these various factors must be more thoroughly described. We note that the conceptual basis in Section 2b3.3a continues to be the same rationale as what is provided for other CMS outcome measures. We struggle to understand how a measure that extends for 90 days beyond the admission would not have research to support the exploration of other risk factors such as whether the individual is discharged to a community with a physician shortage or no pharmacy within a reasonable distance. It is difficult to determine whether additional factors should have been considered without this information and we do not believe that it is responsive to NQF criteria requirements.

We also remain concerned that CMS continues to test social risk factors after assessment of clinical and demographic risk factors and it is unclear why this multi-step approach is preferable. On review of the Evaluation of the NQF Trial period for Risk Adjustment for Social Risk Factors report, it is clear that the approaches to testing these data should be revised to strategies such as multi-level models or testing of social factors prior to clinical factors and that as access to new data becomes available, it may elucidate more differences that are unrelated to factors within a hospital's or physician's control (NQF, 2017). Additional testing is needed to evaluate clinical factors in-conjunction with social risk factors; as opposed to the current approach that prioritizes clinical factors.

Lastly, the AMA questions whether the information provided as a result of this measure is truly useful for accountability and informing patients of the quality of care provided by hospitals. Specifically, our concern relates to the relatively limited amount of variation outlined in section 2b4.3. Specifically, the 10th percentile would yield a rate 1.08% lower and 90th percentile is 1.74% higher than an average facility with a similar patient mix. Endorsing a measure that currently only identifies such a small differences in performance scores does not enable users to distinguish meaning differences in performance.

As a result, the AMA does not believe that either measure meets the NQF criteria for importance, scientific acceptability, and usability and use. We ask that the Standing Committee carefully consider our comments during their evaluation.

3494 Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Submitted by The Federation of American Hospitals (FAH)

The Federation of American Hospitals (FAH) appreciates the opportunity to comment on the Measure of Hospital-level 90-day, All-cause, Risk-standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery. FAH agrees that hospitals should measure and track mortality rates for quality improvement uses but any measure that is proposed for accountability uses should be evidence-based, appropriate for accountability purposes at the designated level of attribution, and demonstrated to be reliable and valid.

FAH does not support attributing this measure to hospitals and the rationale to demonstrate that CABG mortality is an indicator of hospital quality does not provide sufficient evidence that a death in the 90 days following CABG surgery is a true predictor of the quality of care provided by a hospital. FAH believes that while hospitals may be able to contribute to minimizing patient deaths following CABG, much of the variation may well be due to other factors outside of a hospital's control. While FAH does not disagree that examining the rate of mortality in the 90 days following CABG may be useful for quality improvement and to ensure that cost reductions do not negatively impact patient outcomes such as mortality, we do not believe that adequate justification has been made for its attribution to hospitals. Specifically, FAH believes that this measure may be better suited to attribution at higher levels such as accountable care organizations.

In addition, FAH is troubled by the lack of adequate consideration of a broad set of social risk factors in the risk adjustment model. Testing on risk factors beyond dual eligibility status and the AHRQ SES Index should be completed to determine whether adjustment of these risk factors was warranted due to the

extended timeframe (i.e., 90 days). FAH believes that some clinical diagnoses and outcomes will be impacted more significantly by social risk factors (e.g., availability of services such as pharmacies and transportation) and it is even more likely for these factors to influence outcomes that extend well past the time of discharge. Measures must be specified to ensure that they produce results that are reliable and valid and enable fair comparisons. By not providing a comprehensive review of what research and evidence may exist and limiting the review to the usual risk factors, there is increased risk that an entity's true performance will be misrepresented and could provide inaccurate information to patients and their families.

In addition, FAH believes that the risk adjustment approach that many developers use considers the identification and testing of social risk factors as supplementary to clinical risk factors, which was identified as a concern by the NQF Disparities Standing Committee. Given that this was a new measure, it provided an opportunity for the measure developer to include these factors within the testing of the model rather than the previous approach of "adding on" factors after the model is developed. This type of approach would assist hospitals and others in understanding how their inclusion could impact the model and provide additional information for groups examining this issue such as the NQF and Office of the Assistant Secretary for Planning and Evaluation. As a result, the FAH does not believe that this measure lacks sufficient information on the potential impact these social risk variables have on the risk adjustment model.

FAH also questions the usefulness of this measure given the limited variation in performance scores provided in section 2b4.3. We do not believe that these measures provide any new information that would be useful to hospitals and patients since those hospitals in the 10th percentile would have a rate that is 1.08% lower and in the 90th percentile, it would be only 1.74% higher. FAH is unsure how this information would be displayed and whether it would be understandable to a patient and their family or useful to a hospital for accountability or quality improvement uses.

FAH has several concerns related to the lack of evidence to support the measure's focus, lack of adequate testing on social risk factors in the risk adjustment model, and limited usefulness of the results for quality improvement and accountability purposes. As a result, FAH does not believe that either measure meets the NQF measure evaluation criteria for evidence, scientific acceptability, and usability and use.

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