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Executive Summary

Millions of Americans undergo surgical procedures each year, and the rate of these procedures is increasing annually, with 51.4 million inpatient procedures performed in 2010.¹ Surgery is a daunting prospect for patients, who, along with their families, are increasingly seeking information from publicly reported quality measures to make decisions about surgical care. The important aspects of quality for patients and families are the likelihood of surgical success—i.e., the surgery achieving its intended outcome—and avoidance of complications. Given the rapid growth in surgery and surgical procedures, there is growing need to identify and endorse meaningful measures that will improve quality and health outcomes.

The National Quality Forum (NQF) has endorsed surgical measures through a variety of projects since 2004 with the National Voluntary Consensus Standards for Cardiac Surgery. The measures in NQF’s surgery endorsement project focus on key surgical care processes across an array of procedure types that include outcomes for general and subspecialty surgical procedures, including cardiac, orthopedic, ophthalmological, and vascular surgeries and procedures, and all phases of perioperative care. Many of the measures are used in public and/or private sector accountability and quality improvement programs. However, while significant strides have been made in some areas, gaps remain in specific procedure areas like pediatrics, and in specialty areas—in which quality measurement is in its early stages—including orthopedic surgery, bariatric surgery, neurosurgery, obstetrics, and gynecology. Gaps also remain for measures that assess overall surgical quality, shared accountability, and patient focus.

For this project, the Standing Committee evaluated two measures undergoing maintenance review against NQF’s standard evaluation criteria. The Committee recommended both measures for endorsement, and the Consensus Standards Approval Committee (CSAC) upheld the Committee’s recommendations. The endorsed measures are:

- 2063 Performing Cystoscopy at the Time of Hysterectomy for Pelvic Organ Prolapse to Detect Lower Urinary Tract Injury
- 2558 Hospital, All-Cause, 30-Day, Risk Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

The body of this report briefly summarizes the measures that were reviewed. Appendix A includes detailed summaries of the Committee’s discussion and ratings of the criteria for each measure.
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. In 2014, there were 17.2 million hospital visits that included at least one surgery. Of these surgeries, over half occurred in a hospital-owned ambulatory surgical center.

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. 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. 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.

With the continued growth in the outpatient surgery market, monitoring and assessing the quality of the services provided has never held greater importance.

NQF Portfolio of Performance Measures for Surgery

The Surgery Standing Committee (Appendix C) oversees NQF’s portfolio of Surgery measures (Appendix B) which includes measures for perioperative safety, cardiac surgery, vascular surgery, colorectal surgery, and a range of other clinical and procedural subtopics. This portfolio contains 63 measures: 12 process measures, 40 outcome and resource use measures, four structural measures, and seven composite measures (see table below).

Table 1. NQF Surgery Portfolio of Measures

<table>
<thead>
<tr>
<th></th>
<th>Process</th>
<th>Outcome/Resource Use</th>
<th>Structure</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal and Colorectal Surgery</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Anesthesia</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td>5</td>
<td>16</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>General Surgery</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cross-cutting (Inpatient &amp; Outpatient Surgery)</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cross-Cutting (Inpatient Surgery)</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cross-Cutting (Outpatient Surgery)</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Orthopedic Surgery</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
Some 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 June 28, 2018 the Surgery Standing Committee evaluated two measures undergoing maintenance review against NQF’s standard evaluation criteria.

### Table 2. Surgery Measure Evaluation Summary

<table>
<thead>
<tr>
<th></th>
<th>Process</th>
<th>Outcome/Resource Use</th>
<th>Structure</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic Surgery</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Urogynecology/Gynecology</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Vascular Surgery</td>
<td>2</td>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
<td>40</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Comments Received Prior to Committee Evaluation

NQF solicits comments on endorsed measures on an ongoing basis through the [Quality Positioning System (QPS)](https://www.qualityforum.org/products-and-tools/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, 2018 and closed on September 5, 2018. All submitted comments were provided to the Committee prior to its initial deliberations during the measure evaluation web meeting.

Following the Committee’s evaluation of the measures under consideration, NQF received nine comments from five member organizations and individuals pertaining to the draft report and to the measures under consideration. Appendix A summarizes all of these comments.
Throughout the 16-week continuous public commenting period, NQF members had the opportunity to express their support (‘support’ or ‘do not support’) for each measure submitted for endorsement consideration to inform the Committee’s recommendations. Two NQF members supported measure #2063 Performing Cystoscopy at the Time of Hysterectomy for Pelvic Organ Prolapse to Detect Lower Urinary Tract Injury. One member expressed support for measure #2558 Hospital, 30-Day, All-Cause Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery.

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.

Urogynecology

2063 Performing Cystoscopy at the Time of Hysterectomy for Pelvic Organ Prolapse to Detect Lower Urinary Tract Injury (American Urogynecologic Society): Endorsed

Description: Percentage of patients who undergo cystoscopy to evaluate for lower urinary tract injury at the time of hysterectomy for pelvic organ prolapse. Measure Type: Process; Level of Analysis: Clinician: Group/Practice, Clinician: Individual; Setting of Care: Inpatient/Hospital; Data Source: Paper Medical Records, Registry Data

This process measure, originally endorsed in 2014, calculates the percentage of patients who undergo cystoscopy to evaluate lower urinary tract injury during hysterectomy for pelvic organ prolapse. Using cystoscopy to detect lower urinary tract injuries during hysterectomy can reduce morbidity, readmissions, and costs of care. Although the Committee highlighted the importance of outcome measures, they agreed there is a strong link between this process measure and the outcome, a decrease in lower urinary tract injury. Overall, the Committee agreed that the measure met NQF’s evaluation criteria and recommended it for continued endorsement. The Committee agreed that the measure met the scientific acceptability criterion and did not have any concerns with the feasibility of the measure or the usability and use criterion.

Cardiac Surgery

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery (Centers for Medicare & Medicaid Services/Yale CORE): Endorsed

Description: 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. Measure Type: Outcome; Level of Analysis: Facility; Setting of Care: Inpatient/Hospital; Data Source: Claims

This outcome measure, originally endorsed in 2015, aims to improve patient outcomes by providing patients, physicians, hospitals, and policy makers with information about hospital-level, risk-
standardized mortality rates following hospitalization for a qualifying isolated coronary artery bypass graft (CABG) procedure. CABG is a common procedure associated with considerable morbidity, mortality, and healthcare spending. Several factors such as pre-operative patient selection, surgical timing post-coronary event, intraoperative conduct, and other aspects of postoperative care can have an impact on operative mortality. The Committee agreed that the measure met the scientific acceptability criterion and did not have any concerns with the feasibility of the measure or the usability and use criterion. Committee members agreed that identifying institutions’ performance based on the patient case mix can promote hospital quality improvement and better inform consumers about care quality. Overall, the Committee agreed that the measure met NQF evaluation criteria and recommended it for continued endorsement.

**Measures Withdrawn from Consideration**

Three measures previously endorsed by NQF have not been re-submitted for maintenance of endorsement. Endorsement for these measures has been removed.

**Table 3. Measures Withdrawn from Consideration**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason for withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0178 Improvement in Status of Surgical Wounds</td>
<td>The developer states that the measure “is becoming limited in its ability to discriminate among providers’ performance and exhibits poor usability with fewer than 50% of agencies with at least 20 episodes.”</td>
</tr>
<tr>
<td>2052 Reduction of Complications Through the Use of Cystoscopy During Surgery for Stress Urinary Incontinence</td>
<td>Lack of resources to maintain</td>
</tr>
<tr>
<td>1536 Cataracts: Improvement in Patient’s Visual Function within 90 Days Following Cataract Surgery</td>
<td>Developer is working on a new instrument to measure visual function</td>
</tr>
</tbody>
</table>
References


Appendix A: Details of Measure Evaluation

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

Endorsed Measures

2063 Performing Cystoscopy at the Time of Hysterectomy for Pelvic Organ Prolapse to Detect Lower Urinary Tract Injury

Submission | Specifications

Description: Percentage of patients who undergo cystoscopy to evaluate for lower urinary tract injury at the time of hysterectomy for pelvic organ prolapse.

Numerator Statement: Numerator is the number of patients in whom an intraoperative cystoscopy was performed to evaluate for lower urinary tract injury at the time of hysterectomy for pelvic organ prolapse.

Denominator Statement: The number of patients undergoing hysterectomy for pelvic organ prolapse (identified by CPT codes for hysterectomy and ICD9/10 diagnoses of prolapse as listed in S.9).

Exclusions: None

Adjustment/Stratification: No risk adjustment or risk stratification

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

Setting of Care: Inpatient/Hospital

Type of Measure: Process

Data Source: Paper Medical Records, Registry Data

Measure Steward: American Urogynecologic Society

STANDING COMMITTEE MEETING [June 28, 2018]

1. Importance to Measure and Report: The measure meets the Importance criteria (1a. Evidence, 1b. Performance Gap)

1a. Evidence: H-1; M-14; L-0; I-0

1b. Performance Gap: H-0; M-14; L-2; I-0

Rationale:

- This measure is based on evidence that routine cystoscopy increases identification of urinary tract injuries intraoperatively. The Committee also discussed new evidence by Teeluckdharry et al. 2015 that showed 0.2 per thousand (0.02%) of ureteral injuries were recognized at time of hysterectomy performed for prolapse without cystoscopy compared to 10.8 per thousand (0.18%) ureteral injuries recognized with cystoscopy. The Committee also discussed the 2017 American College of Obstetricians and Gynecologist (ACOG) Practice Bulletin on Pelvic Organ Prolapse (Level C evidence) that stated routine cystoscopy during pelvic organ prolapse surgery is recommended when the surgical procedure performed is associated with a significant risk of injury to the bladder or ureter. Finally, the Committee reviewed evidence from an academic study by Chi et al. 2016 that showed that with universal cystoscopy, the unrecognized ureteral injury rate decreased from 0.7% to 0.1%. The Committee stated that performing routine cystoscopy could prevent any delayed complications.
• Committee members noted that this was a process measure and questioned why the developer did not develop an outcome measure to address pelvic organ prolapse. The developer responded that an outcome measure would be desirable, but the outcome is so rare that an outcome measure is not needed. Committee members then questioned the importance of the process measure. The developer clarified that five percent of injuries can go undetected and that the completion of this process is the appropriate action to take for high risk surgeries.

• Committee members also questioned what injury the measure addressed (i.e., ureteral kinking/injury or bladder injury). The developer clarified that the cystoscopy provides information on bladder injuries and whether there is diminished or altered flow through the ureter.

• The Committee agreed that the evidence supported this measure.

• The developer provided performance data from the AUGS Urogynecology Quality Registry (AQUIRE) for 16 providers (503 patients) who submitted 2017 data to Merit-Based Incentive Payment System (MIPS). Cystoscopy procedures ranged from 88.24% to 100%. The overall registry average, which includes providers who did not submit data to MIPS, is 94.7%.

• Ultimately, Committee members agreed that the measure met the performance gap subcriteria.

2. Scientific Acceptability of Measure Properties: The measure meets the Scientific Acceptability criteria
(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity)
2a. Reliability: H-0; M-15; L-0; I-0 2b. Validity: H-0; M-16; L-0; I-0

Rationale:

• The measure calculates the percentage of patients who undergo cystoscopy to evaluate lower urinary tract injury during hysterectomy for pelvic organ prolapse. A Committee member questioned whether prolapses were graded. The developer clarified that prolapses are graded but the grade of prolapse is not relevant for this measure.

• Reliability testing was conducted by comparing chart-abstracted data and billing documents to self-reported performance rates in the AQUIRE registry. The developer calculated the physician-to-physician variance for data in the registry and the variance from the abstracted charts. Physician to physician variance was similar within the registry data set (variance=0.0012222) and the chart review data set (variance=0).

• Validity testing was conducted on 638 patient records. Chi square tests evaluated the differences between the percentage of patients who have an injury detected compared to those who did not have concurrent cystoscopy; readmissions rates due to all cause among those who did and did not have cystoscopy; and rate of readmission among those who do and do not have a lower urinary tract injury detected with intraoperative cystoscopy.

• Cystoscopy was performed in 84.5% of procedures. Women who had cystoscopy were more likely than those who did not have cystoscopy to have an injury detected (6.9% of women who had cystoscopy and 0% of those who did not). Readmission rates due to all causes did not differ among women who did and did not have cystoscopy (4.8% vs 5.1%) and the readmission rate among women who had a lower urinary tract injury was lower than that observed among those who did not have an injury (2.7% vs 5%).

• Overall, the Committee did not have any major concerns regarding the reliability or validity of the measure and agreed that the measure met these criteria.
3. Feasibility: H-0; M-13; L-3; I-0
(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/unintended consequences identified; 3d. Data collection strategy can be implemented)

Rationale:
• The Committee agreed that the data elements are routinely generated, used during care delivery and the measure is feasible to implement.

4. Usability and Use: The maintenance measure meets the Use subcriterion
(Used and useful to the intended audiences for 4a. Accountability and Transparency; 4b. Improvement; and 4c. Benefits outweigh evidence of unintended consequences)

4a. Use: Pass-16; No Pass-0; 4b. Usability: H-0; M-13; L-3; I-0

Rationale:
• This measure is currently used in the Centers for Medicare & Medicaid Services the Merit-based Incentive Payment System (MIPS). The developer indicated that the measure will be publically reported in the Qualified Clinical Data Registry (QCDR) in 2018.

5. Related and Competing Measures
• No related or competing measures noted.

Standing Committee Recommendation for Endorsement: Yes-15; No-0

6. Public and Member Comment
Five comments were submitted supporting the Committee’s decision to recommend the measure for endorsement.

7. Consensus Standards Approval Committee (CSAC) Endorsement Decision
CSAC Endorsement Decision: Yes-15; No-0 (October 23, 2018: Approved for endorsement)

• CSAC upheld the Committee’s decision to recommend the measure for endorsement.

8. Appeals
No appeals were received.
Submission | Specifications

**Description**: 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.

**Numerator Statement**: 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.

**Denominator Statement**: 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.

**Exclusions**: 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.

**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

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**STANDING COMMITTEE MEETING [June 28, 2018]**

1. **Importance to Measure and Report**: The measure meets the Importance criteria (1a. Evidence, 1b. Performance Gap)

   1a. Evidence: Accepted previous evaluation; 1b. Performance Gap: H-7; M-8; L-0; I-0;

   **Rationale**: 

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• The Committee agreed that the measure is supported by evidence that aspects of perioperative, intra and perioperative, and post-operative care practices can reduce 30-day mortality rates following coronary artery bypass graft (CABG) surgery.
• The developer provided performance data from 1,185 hospitals and 138,661 admissions from July 1, 2013 to June 30, 2016. Reported hospital-level risk-standardized mortality rate was 3.3%, ranging from 1.3% - 7.4%. The Committee agreed there is a gap based on the performance data presented by the developer.
• The developer provided performance data for July 2013 – June 2016 by proportion of dual eligible patients, African-American patients, and by the proportion of patients with the Agency for Healthcare Research and Quality (AHRQ) socioeconomic status (SES) Index Scores equal to or below 42.6. Median scores were higher in hospitals with higher proportions of dual eligible patients and in hospitals with higher proportions of patients with SES index scores.
• Ultimately, Committee members agreed that the measure met both the evidence and performance gap subcriteria.

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: Accepted the Scientific Methods Panel evaluation; 2b. Validity: Accepted the Scientific Methods Panel evaluation

Rationale:
• The measure estimates a hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital following a qualifying isolated CABG procedure. The Committee did not have any concerns that the measure as specified could be consistently implemented.
• Reliability testing was conducted at the performance measure score level. A test-retest approach was performed with the correlation coefficient being 0.35, which the Committee stated was sufficient for reliability. Overall, the Committee did not have any major concerns regarding the reliability of the measure and noted that the NQF Scientific Methods Panel was satisfied with the reliability analyses for the measure. The Committee accepted the Methods Panel’s evaluation and did not have a separate vote for reliability of the measure.
• Validity was conducted at the measure score level. Face validity was also assessed by a Technical Expert Panel using a six-point scale obtained from the mortality measure as specified, to provide an accurate distinction between good and bad quality of care. Overall, the Committee did not have any major concerns regarding the validity of the measure and noted that the NQF Scientific Methods Panel was satisfied with the validity analyses for the measure. The Committee accepted the Methods Panel’s evaluation and did not have a separate vote for validity of the measure.

3. Feasibility: H-11; M-4; L-0; I-0
(3a. Clinical data generated during care delivery; 3b. Electronic sources; 3c. Susceptibility to inaccuracies/unintended consequences identified; 3d. Data collection strategy can be implemented)

Rationale:
• The Committee agreed that the data elements are routinely generated, used during care delivery and the measure is feasible to implement.
4. Usability and Use: The maintenance measure meets the Use subcriterion
(Used and useful to the intended audiences for 4a. Accountability and Transparency; 4b. Improvement; and 4c. Benefits outweigh evidence of unintended consequences)

4a. Use: **Pass-15; No Pass-0**

**Rationale:**

- This measure is currently publicly reported and used in CMS Hospital Inpatient Quality Reporting (IQR) program, and has been finalized for the Hospital Value-Based Purchasing (VBP) program.
- The developer indicated that the median risk-standardized mortality rate decreased by 0.1 absolute percentage points from July 2013-June 2014 (median – 3.1%) to July 2015-June 2016 (median – 3.0%).
- Committee members noted that performance results for this measure are considered useful for both accountability and performance improvement activities.

5. Related and Competing Measures

- This measure is related to #0119 Risk-Adjusted Operative Mortality for CABG

- The measure under review has the same target population and measure focus as #0119 Risk Adjusted Operative Mortality for CABG (STS). The developer reported that they have sought to harmonize components of the measure with #0119. Potential areas of harmonization include, target patient population, age, isolated CABG, period of observation, and included hospitals. Measure #2558 assesses death within 30 days of the procedure date. In contrast, measure #0119 assesses both deaths occurring during CABG hospitalization (in-hospital death, even if after 30 days) and deaths occurring within 30 days of procedure date. Additionally, measure #2558 captures all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry as required for #0119.

Standing Committee Recommendation for Endorsement: **Yes-15; No-0**

6. Public and Member Comment

Three comments were submitted for this measure and all were supportive of the Committee’s continued endorsement recommendation. One comment submitted suggested that the measure should have empirical validity testing and that the developer explore the underlying relationship between factors like poverty or neighborhood deprivation on mortality.

The developer provided the following response:

We mainly assessed the validity of the CABG mortality measure (#2558) using a systematic assessment of face validity. As we noted in the submission materials, we convened a Technical Expert Panel with (TEP), which included individuals with a range of perspectives including clinicians, consumers, and purchasers, as well as individuals with experience in quality improvement, performance measurement, and health care disparities.

Separate from this assessment of face validity, we also validated the CABG mortality measure against New York registry data (New York State Cardiac Surgery Reporting System (CSRS) from
the New York Department of Health), which served as empiric validity testing of both the risk model and the hospital level score. Specifically, we compared the performance of the risk model and hospitals risk-standardized outcome rates calculated from the measure which is risk adjusted using claims, with the performance and hospital RSRRs calculated from the registry-based CABG mortality measure, which uses data abstracted from patients’ medical records for risk adjustment. The results of these amylases show that the claims-adjusted model performs similarly and characterizes hospital performance similarly to the measure adjusted using data from patients’ medical records. This analysis is not submitted as an assessment of the measure’s validity. Rather, it is supplemental information presented to the committee for consideration.

In addition, we note that mortality as an outcome allows for a broad view of quality of care that encompasses more than what can be captured by individual process-of-care measures. Specifically, mortality is the primary negative outcome associated with a surgical procedure. Many aspects of peri-operative care, intra- and peri-operative practices and several aspects of post-operative care, including prevention of and response to complications and coordinated transitions to the outpatient environment, have been shown to impact CABG mortality. A number of recent studies have demonstrated that improvements in care can reduce 30-day mortality rates (see NQF Evidence Form for more detail.

We thank the Henry Ford Health System for this thoughtful comment. We did not examine the underlying relationship between factors like poverty or neighborhood deprivation and mortality as an outcome. There are currently no national data sources that make this information available at the level of the individual beneficiary. Therefore, we are limited to the use of data mapped to census block group as a proxy for patient-level information or the use of binary variables such as the dual eligibility for Medicare and Medicaid benefits which does not lend itself to analysis of the extremes. However, CMS remains committed to examining alternative solutions that better reflect the balance of hospital- and patient-level influences on hospital outcome measures for socioeconomically disadvantaged groups and we will examine this suggestion in the future.

Committee members were satisfied with the developer’s response to the public comments and upheld its decision to recommend the measure for endorsement.

7. Consensus Standards Approval Committee (CSAC) Endorsement Decision

CSAC Endorsement Decision: **Yes-15; No-0; Abstain -1** (October 23, 2018: Approved for endorsement)

- Dr. Lee Fleisher, Surgery Standing Committee Co-Chair, explained that measure #2558 is related to measure #0119 Risk Adjusted Operative Mortality for CABG (Society for Thoracic Surgeons). The Surgery Committee determined that there is a need for both measures. Dr. Fleisher noted that measure #2558 assesses death only within 30 days of the procedure date, while measure #0119 assesses both deaths occurring during CABG hospitalization (in-hospital death, even if after 30 days) and deaths occurring within 30 days of procedure date. Karen Dorsey, Yale/CORE developer representative of measure #2558, confirmed that they have sought to harmonize
components of this measure with measure #0119. She also noted that measure #2558 captures all qualifying Medicare FFS patients undergoing CABG regardless of whether their hospital or surgeon participates in the STS registry as required for #0119.

8. Appeals
No appeals were received.
## Appendix B: Surgery Portfolio—Use in Federal Programs

<table>
<thead>
<tr>
<th>NQF #</th>
<th>Title</th>
<th>Federal Programs: Finalized or Implemented as of August 23, 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>0225</td>
<td>At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer</td>
<td>N/A</td>
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<tr>
<td>0456</td>
<td>Participation in a Systematic National Database for General Thoracic Surgery</td>
<td>N/A</td>
</tr>
<tr>
<td>0564/3056</td>
<td>Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
</tr>
<tr>
<td>0565/3057</td>
<td>Cataracts: 20/40 or Better Visual Acuity within 90 Days Following Cataract Surgery</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
</tr>
<tr>
<td>1790</td>
<td>Risk-Adjusted Morbidity and Mortality for Lung Resection for Lung Cancer</td>
<td>N/A</td>
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<td>3294</td>
<td>STS Lobectomy for Lung Cancer Composite Score</td>
<td>N/A</td>
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<td>3357</td>
<td>Facility Level 7-Day Hospital Visits after General Surgery Procedures Performed at Ambulatory Surgical Centers</td>
<td>N/A</td>
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<tr>
<td>3366</td>
<td>Hospital Visits after Urology Ambulatory Surgical Center Procedures</td>
<td>N/A</td>
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<tr>
<td>0697</td>
<td>Risk Adjusted Case Mix Adjusted Elderly Surgery Outcomes Measure</td>
<td>N/A</td>
</tr>
<tr>
<td>0706</td>
<td>Risk Adjusted Colon Surgery Outcome Measure</td>
<td>N/A</td>
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*a Per [CMS Measure Inventory](https://www.cms.gov/medicare/quality-program/quality-measures) as of 12/21/2018*
<table>
<thead>
<tr>
<th>NQF #</th>
<th>Title</th>
<th>Federal Programs: Finalized or Implemented as of August 23, 2018</th>
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<tbody>
<tr>
<td>0127</td>
<td>Preoperative Beta Blockade</td>
<td>N/A</td>
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<tr>
<td>0134</td>
<td>Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>1519</td>
<td>Statin Therapy at Discharge after Lower Extremity Bypass (LEB)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>1523</td>
<td>Rate of Open Repair of Abdominal Aortic Aneurysms (AAA) Where Patients Are Discharged Alive</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>1534</td>
<td>In-hospital mortality following elective EVAR of AAAs</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>1540</td>
<td>Postoperative Stroke or Death in Asymptomatic Patients undergoing Carotid Endarterectomy</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>1550</td>
<td>Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>1551</td>
<td>Hospital-level 30-day, all-cause risk-standardized readmission rate (RSRR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA)</td>
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<td>0114</td>
<td>Risk-Adjusted Postoperative Renal Failure</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0115</td>
<td>Risk-Adjusted Surgical Re-exploration</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0117</td>
<td>Beta Blockade at Discharge</td>
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<td>NQF #</td>
<td>Title</td>
<td>Federal Programs: Finalized or Implemented as of August 23, 2018</td>
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<td>0118</td>
<td>Anti-Lipid Treatment Discharge</td>
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<tr>
<td>0119</td>
<td>Risk-Adjusted Operative Mortality for CABG</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0120</td>
<td>Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)</td>
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<td>0121</td>
<td>Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement</td>
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<td>0122</td>
<td>Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery</td>
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<td>Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery</td>
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<td>0129</td>
<td>Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0131</td>
<td>Risk-Adjusted Stroke/Cerebrovascular Accident</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0134</td>
<td>Use of Internal Mammary Artery (IMA) in Coronary Artery Bypass Graft (CABG)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0236</td>
<td>Coronary Artery Bypass Graft (CABG): Preoperative Beta-Blocker in Patients with Isolated CABG Surgery</td>
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<td>0339</td>
<td>RACHS-1 Pediatric Heart Surgery Mortality Rate (PDI 06)</td>
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<td>0340</td>
<td>RACHS-1 Pediatric Heart Surgery Volume (PDI 7)</td>
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<td>0354</td>
<td>Hip Fracture Mortality Rate (IQI 19)</td>
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<td>0357</td>
<td>Abdominal Aortic Aneurysm (AAA) Repair Volume (IQI 4)</td>
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<td>Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate (IQI 11)</td>
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<td>Pancreatic Resection Mortality Rate (IQI 9)</td>
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<td>Pancreatic Resection Volume (IQI 2)</td>
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<td>Perioperative Anti-platelet Therapy for Patients undergoing Carotid Endarterectomy</td>
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<td>0533</td>
<td>Postoperative Respiratory Failure Rate (PSI 11)</td>
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<td>0564</td>
<td>Cataracts: Complications within 30 Days Following Cataract Surgery Requiring Additional Surgical Procedures</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0696</td>
<td>STS CABG Composite Score (Composite Measure)</td>
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<td>0697</td>
<td>Risk Adjusted Case Mix Adjusted Elderly Surgery Outcomes Measure</td>
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<td>0706</td>
<td>Risk Adjusted Colon Surgery Outcome Measure</td>
<td>N/A</td>
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<tr>
<td>0732</td>
<td>Surgical Volume for Pediatric and Congenital Heart Surgery: Total Programmatic Volume and Programmatic Volume Stratified by the 5 STAT Mortality Categories</td>
<td>N/A</td>
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<td>0733</td>
<td>Operative Mortality Stratified by the 5 STAT Mortality Categories</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>0734</td>
<td>Participation in a National Database for Pediatric and Congenital Heart Surgery</td>
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<td>1501</td>
<td>Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair</td>
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<td>1502</td>
<td>Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery</td>
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<td>1543</td>
<td>Postoperative Stroke or Death in Asymptomatic Patients undergoing Carotid Artery Stenting (CAS)</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<td>1790</td>
<td>Risk-Adjusted Morbidity and Mortality for Lung Resection for Lung Cancer</td>
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<td>2038</td>
<td>Performing vaginal apical suspension at the time of hysterectomy to address pelvic organ prolapse</td>
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<tr>
<td>2063</td>
<td>Performing cystoscopy at the time of hysterectomy for pelvic organ prolapse to detect lower urinary tract injury</td>
<td>• Merit-Based Incentive Payment System (MIPS) Program (Finalized)</td>
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<tr>
<td>2558</td>
<td>Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</td>
<td>• Hospital Compare (Implemented) • Hospital Inpatient Quality Reporting (Implemented) • Hospital Value-Based Purchasing (Finalized)</td>
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<td>2561</td>
<td>STS Aortic Valve Replacement (AVR) Composite Score (Composite Measure)</td>
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<tr>
<td>2563</td>
<td>STS Aortic Valve Replacement (AVR) + Coronary Artery Bypass Graft (CABG) Composite Score (Composite Measure)</td>
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<tr>
<td>2677</td>
<td>Preoperative evaluation for stress urinary incontinence prior to hysterectomy for pelvic organ prolapse</td>
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<tr>
<td>2681</td>
<td>Perioperative Temperature Management</td>
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<td>2683</td>
<td>Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery</td>
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<td>2687</td>
<td>Hospital Visits after Hospital Outpatient Surgery</td>
<td>• Hospital Outpatient Quality Reporting (Finalized)</td>
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<tr>
<td>3030</td>
<td>STS Individual Surgeon Composite Measure for Adult Cardiac Surgery (Composite Measure)</td>
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<td>3031</td>
<td>STS Mitral Valve Repair/Replacement (MVRR) Composite Score (Composite Measure)</td>
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<tr>
<td>3032</td>
<td>STS Mitral Valve Repair/Replacement (MVRR) + Coronary Artery Bypass Graft (CABG) Composite Score (Composite Measure)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Appendix C: Surgery Standing Committee and NQF Staff

STANDING COMMITTEE

Lee Fleisher, MD (Co-Chair)
Professor and Chair of Anesthesiology, University of Pennsylvania/American Society of Anesthesiologists
Philadelphia, Pennsylvania

William Gunnar, MD, JD (Co-Chair)
Director, National Center for Patient Safety, Veterans Health Administration
Ann Arbor, MI

Karl Bilimoria, MD, MS
John B. Murphy Professor of Surgery; Vice President - Quality, Northwestern Medicine; Director, Surgical Outcomes & Quality Improvement Center (SOQIC); Vice Chair for Quality, Department of Surgery, Feinberg School of Medicine, Northwestern University
Chicago, Illinois

Robert Cima, MD, MA
Professor of Surgery, Mayo Clinic
Rochester, Minnesota

Richard Dutton, MD, MBA
Chief Quality Officer, United States Anesthesia Partners
Park Ridge, Illinois

Elisabeth Erekson, MD, MPH, FACOG, FACS
Interim Chair, Department of Obstetrics and Gynecology at the Geisel School of Medicine Dartmouth Hitchcock Medical Center
Manchester, New Hampshire

Frederick Grover, MD
Professor of Cardiothoracic Surgery, University of Colorado School of Medicine
Aurora, Colorado

John Handy, MD
Thoracic Surgeon, American College of Chest Physicians
Portland, Oregon

Mark Jarrett, MD, MBA
Chief Quality Officer, Associate Chief Medical Officer, North Shore-LIJ Health System
Great Neck, New York
Clifford Ko, MD, MS, MSHS, FACS, FASCRS
Director, Division of Research and Optimal Patient Care, American College of Surgeons Professor of Surgery, Department of Surgery, UCLA School of Medicine and Public Health
Chicago, Illinois

Barbara Levy, MD, FACOG, FACS
Vice President, Health Policy, American College of Obstetricians and Gynecologists
Washington, DC

Barry Markman, MD
Senior Medical Director Medicaid, Aetna
Las Vegas, Nevada

Lawrence Moss, MD
Surgeon-in-Chief, Nationwide Children's Hospital
Columbus, Ohio

Amy Moyer
Manager of Value Measurement, The Alliance
Fitchburg, Wisconsin

Keith Olsen, PharmD, FCCP, FCCM
Professor and Dean, College of Pharmacy, University of Arkansas for Medical Sciences
Omaha, Nebraska

Lynn Reede, DNP, MBA, CRNA, FNAP
Chief Clinical Officer, American Association of Nurse Anesthetists
Park Ridge, Illinois

Christopher Saigal, MD, MPH
Professor, UCLA
Los Angeles, California

Salvatore T. Scali, MD, FACS, RPVI
Assistant Professor of Vascular Surgery, University of Florida-Gainesville
Gainesville, Florida

Allan Siperstein, MD
Chairman Endocrine Surgery, Cleveland Clinic
Cleveland, Ohio

Joshua D. Stein, MD, MS
Associate Professor, University of Michigan, Department of Ophthalmology & Visual Sciences, Department of Health Management & Policy, Director, Center for Eye Policy and Innovation
Ann Arbor, Michigan
Larissa Temple, MD  
Colorectal Service, Department of Surgery, Memorial Sloan-Kettering Cancer Center  
New York, New York

Barbee Whitaker, PhD  
Director, American Association of Blood Banks  
Bethesda, Maryland

A.J. Yates, MD  
Associate Professor and Vice Chairman for Quality Management, Department of Orthopedic Surgery, University of Pittsburgh Medical Center  
Pittsburgh, Pennsylvania

NQF STAFF

Elisa Munthali, MPH  
Senior Vice President, Quality Measurement

Melissa Marinelarena, RN, MPA, CPHQ  
Senior Director

Kathryn Goodwin, MS  
Senior Project Manager

Christy Skipper, MS, PMP  
Project Manager

Mauricio Menendez, MS  
Project Analyst
Appendix D: Measure Specifications

2063 Performing Cystoscopy at the Time of Hysterectomy for Pelvic Organ Prolapse to Detect Lower Urinary Tract Injury

STEWARD

American Urogynecologic Society

DESCRIPTION

Percentage of patients who undergo cystoscopy to evaluate for lower urinary tract injury at the time of hysterectomy for pelvic organ prolapse.

TYPE

Process

DATA SOURCE

Paper Medical Records, Registry Data

LEVEL

Clinician: Group/Practice, Clinician: Individual

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

Numerator is the number of patients in whom an intraoperative cystoscopy was performed to evaluate for lower urinary tract injury at the time of hysterectomy for pelvic organ prolapse.

NUMERATOR DETAILS

The number of patients undergoing hysterectomy for pelvic organ prolapse (identified by CPT codes for hysterectomy and ICD9/10 diagnoses of prolapse as listed in S.9) who have concomitant cystoscopy identified upon review of the operative report in the electronic medical record or paper chart.

DENOMINATOR STATEMENT

The number of patients undergoing hysterectomy for pelvic organ prolapse (identified by CPT codes for hysterectomy and ICD9/10 diagnoses of prolapse as listed in S.9).

DENOMINATOR DETAILS

Hysterectomy (identified by CPT codes) performed for the indication of pelvic organ prolapse (identified by supporting ICD9/ICD10 codes)

The prolapse codes for ICD9 -> ICD-10 are, respectively:
618.01 -> N81.11, Cystocele, midline
N81.10, Cystocele, unspecified
618.02 -> N81.12, Cystocele, lateral
618.03 - N81.0, Urethrocele
618.04 - N81.6, Rectocele
618.05 - N81.81, Perineocele
618.2 - N81.2, Incomplete uterovaginal prolapse
618.3 - N81.3, Complete uterovaginal prolapse
618.4 - N81.4, Uterovaginal prolapse, unspecified
618.6 - N81.5, Vaginal enterocoele
618.7 - N81.89, Old laceration of muscles of pelvic floor
618.81 - N81.82, incompetence or weakening of pubocervical tissue
618.82 - N81.83, incompetence or weakening of rectovaginal tissue
618.83 - N81.84, pelvic muscle wasting
CPT codes for hysterectomy are:

57530 Trachelectomy
58150 Total Abdominal Hysterectomy (Corpus and Cervix), w/ or w/out Removal of Tube(s), w/ or w/out Removal of Ovary(s)
58152 Total Abdominal Hysterectomy (Corpus and Cervix), w/ or w/out Removal of Tube(s), w/ or w/out Removal of Ovary(s), with Colpo-Urethrocystopexy (e.g. Marshall-Marchetti-Krantz, Burch)
58180 Supracervical Abdominal Hysterectomy (Subtotal Hysterectomy), w/ or w/out Removal of Tube(s), w/ or w/out Removal of Ovary(s)
58260 Vaginal Hysterectomy, for Uterus 250 G or Less
58262 Vaginal Hysterectomy, for Uterus 250 G or Less, with Removal of Tube(s), and/or Ovary(s)
58263 Vaginal Hysterectomy, for Uterus 250 G or Less, with Removal of Tube(s), and/or Ovary(s), with Repair of Enterocoele
58267 Vaginal Hysterectomy, for Uterus 250 G or Less, with Colpo-Urethrocystopexy (Marshall-Marchetti-Krantz Type, Pereyra Type), w/ or w/out Endoscopic Control
58270 Vaginal Hysterectomy, for Uterus 250 G or Less, with Repair of Enterocoele
58275 Vaginal Hysterectomy, with Total or Partial Vaginectomy
58280 Vaginal Hysterectomy, with Total or Partial Vaginectomy, with Repair of Enterocoele
58290 Vaginal Hysterectomy, for Uterus Greater than 250 G
58291 Vaginal Hysterectomy, for Uterus Greater than 250 G, with Removal of Tube(s) and/or Ovary(s)
58292 Vaginal Hysterectomy, for Uterus Greater than 250 G, with Removal of Tube(s) and/or Ovary(s), with Repair of Enterocoele
58293 Vaginal Hysterectomy, for Uterus Greater than 250 G, with Colpo-Urethrocystopexy (Marshall-Marchetti-Krantz Type, Pereyra Type)
58294 Vaginal Hysterectomy, for Uterus Greater than 250 G, with Repair of Enterocoele
58541 Laparoscopy, Surgical, Supracervical Hysterectomy, for Uterus 250 G or Less
58542 Laparoscopy, Surgical, Supracervical Hysterectomy, for Uterus 250 G or Less, with Removal of Tube(s) and/or Ovary(s)
58543 Laparoscopy, Surgical, Supracervical Hysterectomy, for Uterus Greater than 250 G
58544 Laparoscopy, Surgical, Supracervical Hysterectomy, for Uterus Greater than 250 G, with Removal of Tube(s) and/or Ovary(s)
58550 Laparoscopy, Surgical, with Vaginal Hysterectomy, for Uterus 250 G or Less
58552 Laparoscopy, Surgical, with Vaginal Hysterectomy, for Uterus 250 G or Less, with Removal of Tube(s) and/or Ovary(s)
58553 Laparoscopy, Surgical, with Vaginal Hysterectomy, for Uterus Greater than 250 G
58554 Laparoscopy, Surgical, with Vaginal Hysterectomy, for Uterus Greater than 250 G, with Removal of Tube(s) and/or Ovary(s)
58570 Laparoscopy, Surgical, with Total Hysterectomy, for Uterus 250 G or Less
58571 Laparoscopy, Surgical, with Total Hysterectomy, for Uterus 250 G or Less, with Removal of Tube(s) and/or Ovary(s)
58572 Laparoscopy, Surgical, with Total Hysterectomy, for Uterus Greater than 250 G
58573 Laparoscopy, Surgical, with Total Hysterectomy, for Uterus Greater than 250 G, with Removal of Tube(s) and/or Ovary(s)

EXCLUSIONS
There are no exclusions from the target population.

EXCLUSION DETAILS
There are no exclusions from the target population.

RISK ADJUSTMENT
No risk adjustment or risk stratification

128428| 142482| 144860| 141015| 142127
128428| 142482| 144860| 141015| 142127

STRATIFICATION
We do not plan to stratify the results.

TYPE SCORE
Rate/proportion better quality = higher score

ALGORITHM
1. Denominator: Patients of a specific surgeon or group undergoing hysterectomy or trachelectomy for diagnosis of prolapse as defined by CPT and ICD-9/10 codes are identified from administrative data.
2. Numerator: Electronic medical record or paper chart operative notes are reviewed to identify the performance of a cystoscopy at the time of the procedure identified in the denominator.
3. The numerator is divided by the denominator and multiplied by 100 to calculate a percentage (rate/proportion) 128428| 142482| 144860| 141015| 142127

COPYRIGHT / DISCLAIMER
N/A
2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

STEWARD

Centers for Medicare & Medicaid Services

DESCRIPTION

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

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 (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:

LEVEL

Facility

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

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

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

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
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:
- 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
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
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 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
Statistical risk model
118210  112469  141592  135810  109921  141015  146637  144762
118210  112469  141592  135810  109921  141015  146637  144762

STRATIFICATION
N/A

TYPE SCORE
Rate/proportion better quality = lower score

ALGORITHM
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:

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N/A
### Appendix E1: Related and Competing Measures (tabular format)

#### Comparison of NQF 2558 and NQF 0119

<table>
<thead>
<tr>
<th>Steward</th>
<th>2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</th>
<th>0119 Risk Adjusted Operative Mortality for CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>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.</td>
<td>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</td>
</tr>
<tr>
<td>Type</td>
<td>Outcome</td>
<td>Outcome</td>
</tr>
<tr>
<td>Data Source</td>
<td>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.</td>
<td>Registry Data STS Adult Cardiac Surgery Database Version 2.81 (effective July 1, 2014); Version 2.9 (effective July 1, 2017)</td>
</tr>
<tr>
<td>Level</td>
<td>Facility</td>
<td>Setting</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Facility</td>
<td>Inpatient/Hospital</td>
</tr>
</tbody>
</table>

**Reference:**

No data collection instrument provided Attachment
NQF_2558_CABG_Mortality_Data_Dictionary_12-30-16_v1.0.xlsx
| Denominator Statement | 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. |

<p>| 0119 Risk Adjusted Operative Mortality for CABG | days (Mt30Stat), Mortality Date (MtDate), Mortality Discharge Status (MtDCStat) | All patients undergoing isolated CABG |</p>
<table>
<thead>
<tr>
<th>Denominator Details</th>
<th>Exclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The measure included index admissions for patients:</td>
<td>The CABG surgery mortality measure excludes index admissions for patients:</td>
</tr>
<tr>
<td>1. Having a qualifying isolated CABG surgery during the index admission;</td>
<td>1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data; or,</td>
</tr>
<tr>
<td>2. Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months</td>
<td>2. Discharged against medical advice (AMA).</td>
</tr>
<tr>
<td>prior to the date of the index admission, and enrolled in Part A during the index</td>
<td></td>
</tr>
<tr>
<td>admission; and,</td>
<td></td>
</tr>
<tr>
<td>3. Aged 65 or over.</td>
<td></td>
</tr>
<tr>
<td>Isolated CABG surgeries are defined as those CABG procedures performed without</td>
<td></td>
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<tr>
<td>the following concomitant valve or other major cardiac, vascular, or thoracic</td>
<td></td>
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<tr>
<td>procedures:</td>
<td></td>
</tr>
<tr>
<td>o Valve procedures;</td>
<td></td>
</tr>
<tr>
<td>o Atrial and/or ventricular septal defects;</td>
<td></td>
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<tr>
<td>o Congenital anomalies;</td>
<td></td>
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<tr>
<td>o Other open cardiac procedures;</td>
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</tr>
<tr>
<td>o Heart transplants;</td>
<td></td>
</tr>
<tr>
<td>o Aorta or other non-cardiac arterial bypass procedures;</td>
<td></td>
</tr>
<tr>
<td>o Head, neck, intracranial vascular procedures; or,</td>
<td></td>
</tr>
<tr>
<td>o Other chest and thoracic procedures</td>
<td></td>
</tr>
<tr>
<td>International Classification of Diseases, 9th Revision, Clinical Modification</td>
<td></td>
</tr>
<tr>
<td>(ICD-9) codes as well as International Classification of Disease, 10th Revision</td>
<td></td>
</tr>
<tr>
<td>(ICD-10) codes used to define the cohort are listed in the attached Data Dictionary.</td>
<td></td>
</tr>
<tr>
<td>Number of isolated CABG procedures. The SQL code used to create the function to</td>
<td>N/A</td>
</tr>
<tr>
<td>identify cardiac procedures is provided in the appendix.</td>
<td></td>
</tr>
<tr>
<td>Exclusion Details</td>
<td>Risk Adjustment</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>The CABG surgery mortality measure excludes index admissions for patients:</td>
<td>Statistical risk model</td>
</tr>
<tr>
<td>1. With inconsistent or unknown vital status or other unreliable demographic (age and gender) data.</td>
<td>118210</td>
</tr>
<tr>
<td>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).</td>
<td>111855</td>
</tr>
<tr>
<td>2. Discharged against medical advice (AMA).</td>
<td>N/A</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>3. With more than one qualifying CABG surgery admission in the measurement period.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</td>
<td></td>
</tr>
<tr>
<td>0119 Risk Adjusted Operative Mortality for CABG</td>
<td></td>
</tr>
<tr>
<td>118210</td>
<td>112469</td>
</tr>
<tr>
<td>Stratification</td>
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</tr>
<tr>
<td>Type Score</td>
<td>Rate/proportion better quality = lower score</td>
</tr>
<tr>
<td>Algorithm</td>
<td>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.</td>
</tr>
<tr>
<td>Please refer to numerator and denominator sections for detailed information. 111855</td>
<td>137290</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Submission items</th>
<th>Identified measures: 0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>0536 : 30-day all-cause risk-standardized mortality rate following Percutaneous Coronary Intervention (PCI) for patients with ST</td>
</tr>
</tbody>
</table>

<p>| 0119 Risk Adjusted Operative Mortality for CABG | 5.1 Identified measures: 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 |
|                                                | 0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery |
|                                                | 0121 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement |</p>
<table>
<thead>
<tr>
<th>2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</th>
<th>0119 Risk Adjusted Operative Mortality for CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>segment elevation myocardial infarction (STEMI) or cardiogenic shock</td>
<td>0120 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)</td>
</tr>
<tr>
<td>0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery</td>
<td>0118 : Anti-Lipid Treatment Discharge</td>
</tr>
<tr>
<td>0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery</td>
<td>0117 : Beta Blockade at Discharge</td>
</tr>
<tr>
<td>0119 : Risk-Adjusted Operative Mortality for CABG</td>
<td>0116 : Anti-Platelet Medication at Discharge</td>
</tr>
<tr>
<td>0115 : Risk-Adjusted Surgical Re-exploration</td>
<td>0115 : Risk-Adjusted Surgical Re-exploration</td>
</tr>
<tr>
<td>0114 : Risk-Adjusted Postoperative Renal Failure</td>
<td>0114 : Risk-Adjusted Postoperative Renal Failure</td>
</tr>
<tr>
<td>0131 : Risk-Adjusted Stroke/Cerebrovascular Accident</td>
<td>0131 : Risk-Adjusted Stroke/Cerebrovascular Accident</td>
</tr>
<tr>
<td>0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)</td>
<td>0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)</td>
</tr>
<tr>
<td>0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization</td>
<td>0127 : Preoperative Beta Blockade</td>
</tr>
<tr>
<td>0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older</td>
<td>1501 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair</td>
</tr>
<tr>
<td>1893 : Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization</td>
<td>5a.1 Are specs completely harmonized? Yes</td>
</tr>
<tr>
<td>2515 : Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery</td>
<td>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</td>
</tr>
<tr>
<td>5b.1 If competing, why superior or rationale for additive value: N/A</td>
<td></td>
</tr>
<tr>
<td>2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery</td>
<td>0119 Risk Adjusted Operative Mortality for CABG</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| The 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 E2: Related and Competing Measures (narrative format)

Comparison of NQF 2558 and NQF 0119

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

0119 Risk Adjusted Operative Mortality for CABG

Steward

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Centers for Medicare & Medicaid Services

0119 Risk Adjusted Operative Mortality for CABG
The Society of Thoracic Surgeons

Description

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.

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

Type

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Outcome

0119 Risk Adjusted Operative Mortality for CABG
Outcome

Data Source

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:

No data collection instrument provided Attachment NQF_2558_CABG_Mortality_Data_Dictionary_12-30-16_v1.0.xlsx

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0119</td>
<td>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)</td>
</tr>
</tbody>
</table>

**Level**

- **2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery**
- **Facility**

- **0119 Risk Adjusted Operative Mortality for CABG**
- **Facility, Clinician : Group/Practice**

**Setting**

- **2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery**
- **Inpatient/Hospital**
0119 Risk Adjusted Operative Mortality for CABG
Inpatient/Hospital

Numerator Statement

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.

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

Numerator Details

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.
0119 Risk Adjusted Operative Mortality for CABG

Number of isolated CABG procedures with an operative mortality;
Number of isolated CABG procedures in which Mortality [Mortality (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)

Denominator Statement

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

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.

**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.

**Exclusions**

**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**

**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.
0119 Risk Adjusted Operative Mortality for CABG
N/A

Risk Adjustment

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Statistical risk model
118210 | 112469 | 135810 | 109921 | 141015 | 146637 | 144762
118210 | 112469 | 135810 | 109921 | 141015 | 146637 | 144762

0119 Risk Adjusted Operative Mortality for CABG
Statistical risk model
111855 | 137290 | 114638 | 141015
111855 | 137290 | 114638 | 141015

Stratification

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
N/A

0119 Risk Adjusted Operative Mortality for CABG
N/A

Type Score

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Rate/proportion better quality = lower score

0119 Risk Adjusted Operative Mortality for CABG
Rate/proportion better quality = lower score

Algorithm

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:

0119 Risk Adjusted Operative Mortality for CABG

Please refer to numerator and denominator sections for detailed information. 111855 | 137290 | 114638 | 141015

Submission items

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

5.1 Identified measures: 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
50-day all-cause risk-standardized mortality rate following Percutaneous Coronary Intervention (PCI) for patients with ST segment elevation myocardial infarction (STEMI) or cardiogenic shock

0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery

0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery

0119 : Risk-Adjusted Operative Mortality for CABG

0115 : Risk-Adjusted Surgical Re-exploration

0114 : Risk-Adjusted Postoperative Renal Failure

0131 : Risk-Adjusted Stroke/Cerebrovascular Accident

0130 : Risk-Adjusted Deep Sternal Wound Infection

0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)

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

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.

**0119 Risk Adjusted Operative Mortality for CABG**

5.1 Identified measures: 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
0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery
0121 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement
0120 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)
0118 : Anti-Lipid Treatment Discharge
0117 : Beta Blockade at Discharge
0116 : Anti-Platelet Medication at Discharge
0115 : Risk-Adjusted Surgical Re-exploration
0114 : Risk-Adjusted Postoperative Renal Failure
0131 : Risk-Adjusted Stroke/Cerebrovascular Accident
0130 : Risk-Adjusted Deep Sternal Wound Infection
0129 : Risk-Adjusted Postoperative Prolonged Intubation (Ventilation)
0127 : Preoperative Beta Blockade
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
Appendix F: Pre-Evaluation Comments

Comments received as of June 19, 2018.

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Karen Shehade, Medtronic

Medtronic appreciates the opportunity to submit comments to the National Quality Forum's Surgery Portfolio Committee on the Spring 2018 Cycle Measures. Medtronic supports efforts to "alleviate pain, restore health, and extend life" and Medtronic's Minimally Invasive Therapies Group is actively engaged in developing innovative solutions for monitoring and patient safety to assist in the early detection of preventable, adverse events. We commend the committee for their thorough review and support continued endorsement of these measures.

2558 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery
Claudia Salzberg, Federation of American Hospitals

The Federation of American Hospitals (FAH) appreciates the opportunity to comment on Measure #2558: Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery. The FAH identified several questions and concerns that we note for the Standing Committee’s consideration including:

1A. Evidence to Support the Measure Focus:

The FAH does not disagree with the importance of assessing the mortality rates of those patients who had a hospital admission. However, the FAH does not believe that the Center for Medicare and Medicaid Services (CMS) has provided sufficient evidence for this measure and other mortality measures included in CMS programs that a death in the 30 days following an inpatient admission is a predictor of the quality of care provided by a hospital and may well be due to other factors outside of a hospital’s control. The FAH does not believe that adequate justification has been provided for selection of a 30-day window. On review of the evidence provided for this measure, most, if not all, of the studies cited focus on surgical technique and intra-operative interventions and we did not identify any evidence to support measuring mortality using a 30-day time period.

2B. Validity:

- The FAH questions whether the measure meets the requirements for validity testing for measures undergoing maintenance given the lack of empirical validity testing. Only testing for face validity and the validity of the risk adjustment model were provided.
- The FAH would like to again reiterate our disappointment in the minimal set of variables used to test whether social risk factors should be included in the risk adjustment model. As experience is gained and additional factors are available related to the community in which the patient resides such as
access to transportation or pharmacies, we hope to see further analysis and testing be completed in the near future.

- The FAH would also note that testing of social risk factors in the risk adjustment model demonstrated a statistically significant association for each of the two variables; yet, the developer determined that their inclusion was not needed given the lack of improvement of model performance and hospital profiling. Given the minimal variation in performance scores for this measure, which in 2016 ranged from 1.3% to 7.4%, FAH is concerned that what may appear as small changes in performance scores when either of the two variables are included could shift a hospital’s risk-standardized mortality rate (RSMR) (e.g., from worse than the national rate to no different than the national rate). Regrettably, this analysis was not provided and would provide useful information in determining whether inclusion of these risk factors is warranted.

- In addition, the FAH is concerned that there is insufficient variation in performance across hospitals to support this measure’s use in accountability programs. Specifically, the performance scores reported in 2b4. Identification of Statistically Significant and Meaningful Difference in Performance are generally low with only 17 hospitals identified as better than the national rate, 1,004 as no different than the national rate, and 18 as worse than the national rate.