NATIONAL QUALITY FORUM

Measure Information

This document contains the information submitted by measure developers/stewards, but is organized according to NQF's measure evaluation criteria and process. The item numbers refer to those in the submission form but may be in a slightly different order here. In general, the item numbers also reference the related criteria (e.g., item 1b.1 relates to sub criterion 1b).

Brief Measure Information

NQF #: 1501
Corresponding Measures:
De.2. **Measure Title:** Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair
Co.1.1. **Measure Steward:** The Society of Thoracic Surgeons
De.3. **Brief Description of Measure:** Percent of patients aged 18 years and older undergoing MV Repair who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

(This measure applies to the procedure of MV repair, regardless of approach)
1b.1. **Developer Rationale:** Mortality is likely the single most important negative outcome that can be associated with a surgical procedure. Operative mortality, defined as mortality within 30 days of surgery or on the same hospital admission, should include nearly all deaths that occur as a direct result of the surgery or an immediate postoperative complication. Critical evaluation of operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk.

- Birkmeyer NJ, Marrin CA, et al. Decreasing mortality for aortic and mitral valve surgery in Northern New England. Northern New England Cardiovascular Disease Study Group. Ann Thorac Surg. 2000;70(2):432-437.

- Edwards FH, Petyerson ED, et al. Prediction of operative mortality following valve replacement surgery. JACC. 37:3:885-892.

- Goodney PP, O'Connor GT, et al. Do hospitals with low mortality rates in coronary artery bypass also perform well in valve replacement? Ann Thorac Surg. 2003;76:1131-1137.

- Mehta RH, Eagle KA, et al. Influence of age on outcomes in patients undergoing mitral valve replacement. Ann Thorac Surg. 2002;74:1459-1467.

- Iribarne A, Russo MJ, Easterwood R et al. Minimally invasive versus sternotomy approach for mitral valve surgery: a propensity analysis. Ann Thorac Surg. 2010;90:1471–1477

- LaPar DJ, Hennessy S, Fonner E, et al. Does urgent or emergent status influence choice in mitral valve operations? An analysis of outcomes from the Virginia Cardiac Surgery Quality Initiative. 2010;90:153-60

- Umakanthan R, Petracek MR, Leacche M et al, Minimally invasive right lateral thoracotomy without aortic cross-clamping: an attractive alternative to repeat sternotomy for reoperative mitral valve surger;y. J Heart Valve Dis. 2010;19:236-43

- Vassileva CM, McNeely C, Spertus J, Markwell S, Hazelrigg S. Hospital volume, mitral repair rates, and mortality in mitral valve surgery in the elderly: An analysis of US hospitals treating Medicare fee-for-service patients. J Thorac Cardiovasc Surg. 2014pii: S0022-5223(14)01290-2

- Chatterjee S, Rankin JS, Gammie JS, et al. Isolated mitral valve surgery risk in 77,836 patients from the Society of Thoracic Surgeons database. Ann Thorac Surg. 2013;96:1587-94

- LaPar DJ, Ailawadi G, Isbell JM, et al. Virginia Cardiac Surgery Quality Initiative. Mitral valve repair rates correlate with surgeon and institutional experience. J Thorac Cardiovasc Surg. 2014;148:995-1003

- Gonzalez AA, Dimick JB, Birkmeyer JD, Ghaferi AA. Understanding the Volume -Outcome Effect In Cardiovascular Surgery: the Role of Failure to Rescue" JAMA Surg. 2014:149,119-123.

- Nimptsch U, Mansky T. Hospital volume and mortality for 25 types of inpatient treatment in German hospitals: observational study using complete national data from 2009 to 2014.

- Myles PS. Meaningful outcome measures in cardiac surgery. J Extra Corpor Technol. 2014:46; 23-27.

- Martinez EA. Quality, Patient Safety, and the Cardiac Surgical Team. Anesthesiology Clin. 2013:31; 249-268.

S.4. **Numerator Statement:** Number of patients aged 18 years and older undergoing MV Repair 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
S.6. **Denominator Statement:** All patients undergoing isolated MV repair surgery
S.8. **Denominator Exclusions:** N/A

De.1. **Measure Type:** Outcome
S.17. **Data Source:** Registry Data
S.20. **Level of Analysis:** Clinician : Group/Practice, Facility

IF Endorsement Maintenance – Original Endorsement Date: Dec 02, 2011 **Most Recent Endorsement Date:** Jun 10, 2019

IF this measure is included in a composite, NQF Composite#/title:

IF this measure is paired/grouped, NQF#/title:

De.4. **IF PAIRED/GROUPED, what is the reason this measure must be reported with other measures to appropriately interpret results?**

1. Evidence, Performance Gap, Priority – Importance to Measure and Report

Extent to which the specific measure focus is evidence-based, important to making significant gains in healthcare quality, and improving health outcomes for a specific high-priority (high-impact) aspect of healthcare where there is variation in or overall less-than-optimal performance. ***Measures must be judged to meet all sub criteria to pass this criterion and be evaluated against the remaining criteria.***

1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form
1501_evid_attmt_Fall-2018.docx
1a.1 <u>For Maintenance of Endorsement:</u> Is there new evidence about the measure since the last update/submission?
Do not remove any existing information. If there have been any changes to evidence, the Committee will consider the new evidence. Please use the most current version of the evidence attachment (v7.1). Please use red font to indicate updated evidence.
No

1b. Performance Gap

Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating:

- considerable variation, or overall less-than-optimal performance, in the quality of care across providers; and/or
- Disparities in care across population groups.

1b.1. **Briefly explain the rationale for this measure** *(e.g., how the measure will improve the quality of care, the benefits or improvements in quality envisioned by use of this measure)*
<u>If a COMPOSITE</u> (e.g., combination of component measure scores, all-or-none, any-or-none), SKIP this question and answer the composite questions.
Mortality is likely the single most important negative outcome that can be associated with a surgical procedure. Operative mortality, defined as mortality within 30 days of surgery or on the same hospital admission, should include nearly all deaths that

occur as a direct result of the surgery or an immediate postoperative complication. Critical evaluation of operative mortality allows one to evaluate the risk associated with a given procedure for various patient characteristics, and more importantly, aggressively search for ways to minimize that risk.

- Birkmeyer NJ, Marrin CA, et al. Decreasing mortality for aortic and mitral valve surgery in Northern New England. Northern New England Cardiovascular Disease Study Group. Ann Thorac Surg. 2000;70(2):432-437.

- Edwards FH, Petyerson ED, et al. Prediction of operative mortality following valve replacement surgery. JACC. 37:3:885-892.

- Goodney PP, O'Connor GT, et al. Do hospitals with low mortality rates in coronary artery bypass also perform well in valve replacement? Ann Thorac Surg. 2003;76:1131-1137.

- Mehta RH, Eagle KA, et al. Influence of age on outcomes in patients undergoing mitral valve replacement. Ann Thorac Surg. 2002;74:1459-1467.

- Iribarne A, Russo MJ, Easterwood R et al. Minimally invasive versus sternotomy approach for mitral valve surgery: a propensity analysis. Ann Thorac Surg. 2010;90:1471–1477

- LaPar DJ, Hennessy S, Fonner E, et al. Does urgent or emergent status influence choice in mitral valve operations? An analysis of outcomes from the Virginia Cardiac Surgery Quality Initiative. 2010;90:153-60

- Umakanthan R, Petracek MR, Leacche M et al, Minimally invasive right lateral thoracotomy without aortic cross-clamping: an attractive alternative to repeat sternotomy for reoperative mitral valve surger;y. J Heart Valve Dis. 2010;19:236-43

- Vassileva CM, McNeely C, Spertus J, Markwell S, Hazelrigg S. Hospital volume, mitral repair rates, and mortality in mitral valve surgery in the elderly: An analysis of US hospitals treating Medicare fee-for-service patients. J Thorac Cardiovasc Surg. 2014pii: S0022-5223(14)01290-2

- Chatterjee S, Rankin JS, Gammie JS, et al. Isolated mitral valve surgery risk in 77,836 patients from the Society of Thoracic Surgeons database. Ann Thorac Surg. 2013;96:1587-94

- LaPar DJ, Ailawadi G, Isbell JM, et al. Virginia Cardiac Surgery Quality Initiative. Mitral valve repair rates correlate with surgeon and institutional experience. J Thorac Cardiovasc Surg. 2014;148:995-1003

- Gonzalez AA, Dimick JB, Birkmeyer JD, Ghaferi AA. Understanding the Volume -Outcome Effect In Cardiovascular Surgery: the Role of Failure to Rescue" JAMA Surg. 2014:149,119-123.

- Nimptsch U, Mansky T. Hospital volume and mortality for 25 types of inpatient treatment in German hospitals: observational study using complete national data from 2009 to 2014.

- Myles PS. Meaningful outcome measures in cardiac surgery. J Extra Corpor Technol. 2014:46; 23-27.

- Martinez EA. Quality, Patient Safety, and the Cardiac Surgical Team. Anesthesiology Clin. 2013:31; 249-268.

1b.2. Provide performance scores on the measure as specified (current and over time) at the specified level of analysis. *(This is required for maintenance of endorsement. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include.) This information also will be used to address the sub-criterion on improvement (4b1) under Usability and Use.*
The measure was calculated using STS data for patients undergoing isolated MV repair in two consecutive time periods, July 2011 – June 2014 and July 2014 – June 2017.

The summary statistic provided is the Participant´s Estimated Odds Ratio (OR) based on a hierarchical logistic regression analysis. The OR measures the impact that a participant´s performance level has on a patient´s probability of experiencing an adverse outcome. An OR greater than 1.0 implies that the participant increases a patient´s risk of experiencing the outcome, relative to an average STS participant. An OR less than 1.0 implies that the participant decreases a patient´s risk of experiencing the outcome,

relative to an "average" STS participant. A high OR is undesirable and we define the percentiles with increasing OR. For example, 10% of STS participants have an OR greater than the value indicated by the "90th percentile" below.

Also provided is the distribution of the risk adjusted event rate. The risk adjusted rate is an estimate of the participant´s event rate if, hypothetically, the case-mix of the patients treated by the participants is the same as the overall STS case-mix. It is calculated by the OR of the participant, other patient level parameter estimates from the hierarchical logistic model, and the overall STS event rate, by:

STS event rate * (Participant´s Expected Event Rate) / (Participant´s Expected Event Rate Assuming Its Performance = STS Average Performance)

In the above equation, "Participant´s Expected Event Rate" is calculated with the participant´s actual OR, and "Participant´s Expected Event Rate Assuming Its Performance = STS Average Performance" is calculated by assuming the participant´s OR = 1 (i.e. no difference in performance from the STS average).

Distribution of participant-specific risk adjusted odds ratio and event rates in July 2011 - June 2014 and July 2014 - June 2017

Distribution	July 2011 - June 2014 Odds ratio	July 2011 - June 2014 Risk adjusted Rate, %	July 2014 - June 2017 Odds ratio	July 2014 - June 2017 Risk adjusted Rate, %
# Participant	986	986	993	993
# Operations	25694	25694	26475	26475
Mean	1.02	1.28	1.08	1.19
STD	0.19	0.22	0.40	0.42
IQR	0.055	0.066	0.092	0.10
0%	0.52	0.65	0.34	0.38
10%	0.89	1.12	0.81	0.92
20%	0.93	1.17	0.89	1.00
30%	0.95	1.20	0.92	1.03
40%	0.97	1.22	0.95	1.06
50%	0.98	1.23	0.97	1.08
60%	0.99	1.24	0.98	1.10
70%	1.00	1.25	0.99	1.11
80%	1.03	1.28	1.07	1.19
90%	1.29	1.60	1.60	1.76
100%	2.56	2.83	4.35	4.64
Midwest	286	286	273	273
Northeast	134	134	138	138
Other	0	0	7	7
South	354	354	361	361
West	212	212	214	214

*Other Region: Ontario, Canada

(Please see Appendix if table of performance values does not display clearly above.)

1b.3. If no or limited performance data on the measure as specified is reported in 1b2, then provide a summary of data from the literature that indicates opportunity for improvement or overall less than optimal performance on the specific focus of measurement.
N/A

1b.4. Provide disparities data from the measure as specified (current and over time) by population group, e.g., by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability. *(This is required for maintenance of endorsement. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included.) For measures that show high levels of performance, i.e., "topped out", disparities data may demonstrate an opportunity for improvement/gap in care for certain sub-populations. This information also will be used to address the sub-criterion on improvement (4b1) under Usability and Use.*
Even though the measure is used to measure participant-level results, we understand it is of interest to see whether disparity exists

between race and sex groups. We provide below the participant level distribution of the measure by race, ethnicity and sex.

Distribution of participant-specific risk adjusted odds ratio in July 2011 - June 2014 and July 2014 - June 2017, by sex

Distribution	Male July 11 - June 14		Male July 14 - June 17	Female July 11 - June 14	Female July 14 - June 17
# Participant	921	939	897	895	
# Operations	15382	16266	10312	10209	
Mean	1.01	1.15	1.07	1.25	
STD	0.085	0.76	0.38	1.12	
IQR	0.021	0.086	0.07	0.096	
0%	0.64	0.38	0.54	0.38	
10%	0.95	0.82	0.86	0.80	
20%	0.97	0.89	0.91	0.87	
30%	0.98	0.93	0.94	0.91	
40%	0.99	0.95	0.96	0.94	
50%	0.99	0.97	0.97	0.95	
60%	1.00	0.98	0.98	0.97	
70%	1.00	0.99	0.99	0.98	
80%	1.00	1.00	1.00	0.99	
90%	1.13	1.91	1.59	2.38	
100%	1.63	9.54	4.38	14.42	

Distribution of participant-specific risk adjusted event rates (%) in July 2011 - June 2014 and July 2014 - June 2017, by sex

Distribution	Male July 11 - June 14		Male July 14 - June 17	Female July 11 - June 14	Female July 14 - June 17
# Participant	921	939	897	895	
# Operations	15382	16266	10312	10209	
Mean	0.99	1.02	1.70	1.77	
STD	0.08	0.61	0.57	1.46	
IQR	0.021	0.076	0.11	0.14	
0%	0.64	0.34	0.90	0.54	
10%	0.95	0.74	1.39	1.16	
20%	0.96	0.80	1.46	1.25	
30%	0.97	0.83	1.51	1.31	
40%	0.98	0.85	1.54	1.35	
50%	0.98	0.87	1.56	1.37	
60%	0.99	0.88	1.58	1.40	
70%	0.99	0.89	1.59	1.41	
80%	0.99	0.89	1.60	1.43	
90%	1.09	1.64	2.51	3.23	
100%	1.59	8.07	5.63	19.23	

Distribution of participant-specific risk adjusted odds ratio in July 2011 - June 2014 and July 2014 - June 2017, by age

Distribution	Age < 75, July 11 - June 14		Age < 75, July 14- June 17	Age = 75, July 11 - June 14	Age = 75, July 14 - June 17
# Participant	973	981	724	709	
# Operations	21718	22871	3976	3604	
Mean	1.06	1.19	1.00	1.04	
STD	0.37	0.88	0.019	0.27	
IQR	0.068	0.10	0.0052	0.044	
0%	0.50	0.29	0.93	0.60	
10%	0.86	0.78	0.99	0.89	
20%	0.91	0.86	0.99	0.93	
30%	0.94	0.91	0.99	0.96	
40%	0.96	0.94	1.00	0.97	
50%	0.97	0.96	1.00	0.98	
60%	0.98	0.97	1.00	0.98	
70%	0.99	0.99	1.00	0.99	

80%	1.00	1.00	1.00	0.99
90%	1.55	2.16	1.03	1.43
100%	4.99	12.23	1.15	3.39

Distribution of participant-specific risk adjusted event rates (%) in July 2011 - June 2014 and July 2014 - June 2017, by age

Distribution	Age < 75, July 11 - June 14	Age < 75, July 14- June 17	Age = 75, July 11 - June 14	Age = 75, July 14 - June 17
# Participant	973	981	724	709
# Operations	21718	22871	3976	3604
Mean	0.91	1.01	3.11	2.59
STD	0.30	0.70	0.054	0.64
IQR	0.057	0.085	0.015	0.10
0%	0.44	0.25	2.90	1.57
10%	0.74	0.67	3.07	2.25
20%	0.79	0.74	3.08	2.34
30%	0.81	0.78	3.09	2.40
40%	0.83	0.80	3.10	2.42
50%	0.84	0.82	3.10	2.44
60%	0.85	0.83	3.10	2.46
70%	0.85	0.85	3.10	2.47
80%	0.86	0.85	3.10	2.48
90%	1.30	1.82	3.19	3.39
100%	4.02	9.48	3.54	7.80

At the operation level, we were able to estimate the risk adjusted odds ratios between race groups. The odds ratios were estimated from a model with race and other covariates from the 2008 validated Valve risk models.

Risk Adjusted OR:

- Black vs. White (including patients with race other than Black, White, Asian):

0.98 (0.63-1.51)

- Asian vs. White (including patients with race other than Black, White, Asian):

0.99 (0.48-2.04)

(Please see Appendix if tables do not display clearly above.)

1b.5. **If no or limited data on disparities from the measure as specified is reported in 1b.4, then provide a summary of data from the literature that addresses disparities in care on the specific focus of measurement. Include citations. Not necessary if performance data provided in 1b.4**

N/A

2. Reliability and Validity—Scientific Acceptability of Measure Properties

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. ***Measures must be judged to meet the sub criteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.***

2a.1. Specifications The measure is well defined and precisely specified so it can be implemented consistently within and across organizations and allows for comparability. eMeasures should be specified in the Health Quality Measures Format (HQMF) and the Quality Data Model (QDM).

De.5. **Subject/Topic Area** *(check all the areas that apply):*

Cardiovascular, Surgery, Surgery : Cardiac Surgery

De.6. **Non-Condition Specific***(check all the areas that apply):*

Safety, Safety : Complications

De.7. **Target Population Category** *(Check all the populations for which the measure is specified and tested if any):*
Elderly

S.1. **Measure-specific Web Page** *(Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.)*
https://www.sts.org/sites/default/files/documents/ACSD_DataCollectionFormV2_9_Annotated.pdf;
https://www.sts.org/sites/default/files/documents/ACSD_DataSpecificationsV2_9.pdf

S.2a. **If this is an eMeasure**, HQMF specifications must be attached. Attach the zipped output from the eMeasure authoring tool (MAT) - if the MAT was not used, contact staff. (Use the specification fields in this online form for the plain-language description of the specifications)
This is not an eMeasure **Attachment:**

S.2b. **Data Dictionary, Code Table, or Value Sets** *(and risk model codes and coefficients when applicable) must be attached. (Excel or csv file in the suggested format preferred - if not, contact staff)*
Attachment **Attachment:** S.15._Isolated_Valve_Surgery_Risk_Model_Specifications-635570240110217273-636220006330580328.docx

S.2c. Is this an instrument-based measure (i.e., data collected via instruments, surveys, tools, questionnaires, scales, etc.)? Attach copy of instrument if available.
No, this is not an instrument-based measure **Attachment:**

S.2d. Is this an instrument-based measure (i.e., data collected via instruments, surveys, tools, questionnaires, scales, etc.)? Attach copy of instrument if available.
Not an instrument-based measure

S.3.1. **For maintenance of endorsement:** Are there changes to the specifications since the last updates/submission. If yes, update the specifications for S1-2 and S4-22 and explain reasons for the changes in S3.2.
No

S.3.2. **For maintenance of endorsement,** please briefly describe any important changes to the measure specifications since last measure update and explain the reasons.
No changes since last measure update.

(In previous endorsement maintenance cycle [2015], the denominator time window was changed from 60 months to 36 months. Differences between results for 3 and 5 years were minor; the 3-year window was selected because this time frame provides more current and relevant data.)

S.4. **Numerator Statement** *(Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome) DO NOT include the rationale for the measure.*
IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm (S.14).
Number of patients aged 18 years and older undergoing MV Repair 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

S.5. **Numerator Details** *(All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, time period for data collection, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*
IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm (S.14).
Number of isolated MV repair procedures with an operative mortality;

Number of isolated MV repair procedures in which Mortality [Mortalty (STS Adult Cardiac Surgery Database Version 2.73)] 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)

S.6. **Denominator Statement** *(Brief, narrative description of the target population being measured)*
All patients undergoing isolated MV repair surgery

S.7. **Denominator Details** *(All information required to identify and calculate the target population/denominator such as definitions, time period for data collection, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b.)*
IF an OUTCOME MEASURE, describe how the target population is identified. Calculation of the risk-adjusted outcome should be described in the calculation algorithm (S.14).
Number of isolated mitral valve repair procedures. The SQL code used to create the function used to identify cardiac procedures is provided in the Appendix.

S.8. **Denominator Exclusions** *(Brief narrative description of exclusions from the target population)*
N/A

S.9. **Denominator Exclusion Details** *(All information required to identify and calculate exclusions from the denominator such as definitions, time period for data collection, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b.)*
N/A

S.10. **Stratification Information** *(Provide all information required to stratify the measure results, if necessary, including the stratification variables, definitions, specific data collection items/responses, code/value sets, and the risk-model covariates and coefficients for the clinically-adjusted version of the measure when appropriate – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b.)*
N/A

S.11. **Risk Adjustment Type** (Select type. Provide specifications for risk stratification in measure testing attachment)
Statistical risk model
If other:

S.12. **Type of score:**
Rate/proportion
If other:

S.13. **Interpretation of Score** *(Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)*
Better quality = Lower score

S.14. **Calculation Algorithm/Measure Logic** (*Diagram or describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; time period for data, aggregating data; risk adjustment; etc.)*
Please refer to numerator and denominator sections for detailed information.

S.15. **Sampling** *(If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)*
IF an instrument-based performance measure (e.g., PRO-PM), identify whether (and how) proxy responses are allowed.
N/A

S.16. **Survey/Patient-reported data** *(If measure is based on a survey or instrument, provide instructions for data collection and guidance on minimum response rate.)*
Specify calculation of response rates to be reported with performance measure results.
N/A

S.17. **Data Source** *(Check ONLY the sources for which the measure is SPECIFIED AND TESTED).*
If other, please describe in S.18.
Registry Data

S.18. **Data Source or Collection Instrument** *(Identify the specific data source/data collection instrument (e.g. name of database, clinical registry, collection instrument, etc., and describe how data are collected.)*
IF instrument-based, identify the specific instrument(s) and standard methods, modes, and languages of administration.
STS Adult Cardiac Surgery Database Version 2.81 (effective July 1, 2014); Version 2.9 (effective July 1, 2017)

S.19. **Data Source or Collection Instrument** *(available at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)*
Available at measure-specific web page URL identified in S.1

S.20. **Level of Analysis** *(Check ONLY the levels of analysis for which the measure is SPECIFIED AND TESTED)*
Clinician : Group/Practice, Facility

S.21. **Care Setting** *(Check ONLY the settings for which the measure is SPECIFIED AND TESTED)*
Inpatient/Hospital
If other:

S.22. **COMPOSITE Performance Measure** - Additional Specifications *(Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.)*
N/A

2. Validity – See attached Measure Testing Submission Form
1501_NQF_testing_attachment_7-1_v1-0718.docx

2.1 For maintenance of endorsement
Reliability testing: If testing of reliability of the measure score was not presented in prior submission(s), has reliability testing of the measure score been conducted? If yes, please provide results in the Testing attachment. Please use the most current version of the testing attachment (v7.1). Include information on all testing conducted (prior testing as well as any new testing); use red font to indicate updated testing.
Yes

2.2 For maintenance of endorsement
Has additional empirical validity testing of the measure score been conducted? If yes, please provide results in the Testing attachment. Please use the most current version of the testing attachment (v7.1). Include information on all testing conducted (prior testing as well as any new testing); use red font to indicate updated testing.
Yes

2.3 For maintenance of endorsement
Risk adjustment: For outcome, resource use, cost, and some process measures, risk-adjustment that includes social risk factors is not prohibited at present. Please update sections 1.8, 2a2, 2b1,2b4.3 and 2b5 in the Testing attachment and S.140 and S.11 in the online submission form. NOTE: These sections must be updated even if social risk factors are not included in the risk-adjustment strategy. You MUST use the most current version of the Testing Attachment (v7.1) -- older versions of the form will not have all required questions.
Yes - Updated information is included

3. Feasibility

Extent to which the specifications including measure logic, require data that are readily available or could be captured without undue burden and can be implemented for performance measurement.

3a. Byproduct of Care Processes
For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order).

3a.1. **Data Elements Generated as Byproduct of Care Processes.**
Generated or collected by and used by healthcare personnel during the provision of care (e.g., blood pressure, lab value, diagnosis, depression score), Abstracted from a record by someone other than person obtaining original information (e.g., chart abstraction for quality measure or registry)
If other:

3b. Electronic Sources

The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified.

3b.1. **To what extent are the specified data elements available electronically in defined fields** (*i.e., data elements that are needed to compute the performance measure score are in defined, computer-readable fields*) Update this field for **maintenance of endorsement**.
Some data elements are in defined fields in electronic sources

3b.2. **If ALL the data elements needed to compute the performance measure score are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.** For **maintenance of endorsement**, if this measure is not an eMeasure (eCQM), please describe any efforts to develop an eMeasure (eCQM).
As of November 2018, the STS Adult Cardiac Surgery Database has 1,091 participants in the U.S. and Canada, and local availability of data elements in electronic format will vary across institutions. Some institutions may have full EHR capability while others may have partial, or no availability. However, all data elements from participating institutions are submitted to the STS Adult Cardiac Surgery Database in electronic format following a standard set of data specifications. The majority of participating institutions obtain data entry software products that are certified for the purposes of collecting STS Adult Cardiac Surgery Database data elements.

3b.3. **If this is an eMeasure, provide a summary of the feasibility assessment in an attached file or make available at a measure-specific URL. Please also complete and attach the NQF Feasibility Score Card.**
Attachment:

3c. Data Collection Strategy

Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use). For eMeasures, a feasibility assessment addresses the data elements and measure logic and demonstrates the eMeasure can be implemented or feasibility concerns can be adequately addressed.

3c.1. **Required for maintenance of endorsement. Describe difficulties (as a result of testing and/or operational use of the measure) regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.**
IF instrument-based, consider implications for both individuals providing data (patients, service recipients, respondents) and those whose performance is being measured.
The data elements included in this measure have been standard in the STS Adult Cardiac Surgery Database for at least 3 years and some of them have been part of the database for more than 20 years. The variables are considered to be data elements that are readily available and already collected as part of the process of providing care.

3c.2. **Describe any fees, licensing, or other requirements to use any aspect of the measure as specified** *(e.g., value/code set, risk model, programming code, algorithm)*.
Data Collection:
There are no direct costs to collect the data for this measure. Costs to develop the measure included volunteer cardiothoracic surgeon time, STS staff time, and Duke Clinical Research Institute statistician and project management time.

Other fees:
STS Adult Cardiac Surgery Database participants (single cardiothoracic surgeons or a group of surgeons) pay annual participant fees of $3,500 or $4,750, depending on whether the majority of surgeons in a participant group are STS members. As a benefit of STS membership, the member-majority participants are charged the lesser of the two fees. Also, member-majority participants pay an additional fee of $150 per surgeon; non-member-majority participants pay an additional fee of $350 per surgeon.

4. Usability and Use

Extent to which potential audiences (e.g., consumers, purchasers, providers, policy makers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

4a. Accountability and Transparency

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided.

4.1. Current and Planned Use

NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.

Specific Plan for Use	Current Use (for current use provide URL)
	Public Reporting STS Public Reporting Online https://publicreporting.sts.org/ Quality Improvement (Internal to the specific organization) STS Adult Cardiac Surgery Database http://www.sts.org/sts-national-database/database-managers/adult-cardiac-surgery-database

4a1.1 For each CURRENT use, checked above (update for maintenance of endorsement), provide:

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included
- Level of measurement and setting

Voluntary public reporting – approximately 67% of STS Adult Cardiac Surgery Database participants are enrolled as of November 2018.

As of January 2019, this measure will be publicly reported as a component of the Absence of Operative Mortality domain of the mitral valve repair/replacement (MVRR) composite.
(https://publicreporting.sts.org/acsd)

STS Adult Cardiac Surgery Database Participant Feedback Reports provide performance results for this measure to participants. (see details in 4a2.1.1 below)

4a1.2. If not currently publicly reported OR used in at least one other accountability application (e.g., payment program, certification, licensing) what are the reasons? (*e.g., Do policies or actions of the developer/steward or accountable entities restrict access to performance results or impede implementation?*)
Public reporting to begin in 2019; see response under 4a1.1

4a1.3. If not currently publicly reported OR used in at least one other accountability application, provide a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement. (*Credible plan includes the specific program, purpose, intended audience, and timeline for implementing the measure within the specified timeframes. A plan for accountability applications addresses mechanisms for data aggregation and reporting.*)
N/A

4a2.1.1. Describe how performance results, data, and assistance with interpretation have been provided to those being measured or other users during development or implementation.

How many and which types of measured entities and/or others were included? If only a sample of measured entities were included, describe the full population and how the sample was selected.
As of November 2018, there are 1,091 active U.S. and Canadian participants in the STS Adult Cardiac Surgery Database (ACSD). A "participant" is a cardiothoracic surgeon or group of cardiothoracic surgeons who agree to submit case records for analysis and comparison with benchmarking data for quality improvement initiatives. At the option of the surgeon or surgical group, the ACSD participant can include a hospital and/or associated anesthesiologists. It is for this reason that we have indicated (on the Specifications tab, question #S.20) that this measure is specified/tested for both the "clinician: group/practice" and "facility" levels of analysis.

All ACSD participants receive quarterly data reports with their performance results, reported in an easy-to-understand format. The participant's score is illustrated graphically in relation to the 25th, 50th and 75th percentiles of the distribution across all participants who were eligible for inclusion in that quarter´s analysis, and is also accompanied by the 95% Bayesian credible interval. Surgeons easily grasp this result and the visual display clearly illustrates how they perform compared to their peers on a quarterly basis. In addition, these risk-adjusted results allow surgeons to compare their patients´ outcomes with national benchmarks and to initiate quality improvement efforts as needed.

4a2.1.2. **Describe the process(es) involved, including when/how often results were provided, what data were provided, what educational/explanatory efforts were made, etc.**
Please see response under 4a2.1.1

4a2.2.1. **Summarize the feedback on measure performance and implementation from the measured entities and others described in 4d.1.**
Describe how feedback was obtained.
The adult cardiac surgeons from across the U.S. who comprise the STS Adult Cardiac Surgery Task Force meet periodically to discuss the participant reports and to consider potential enhancements to the ACSD. Additions/clarifications to the data collection form and to the content/format of the participant reports are discussed and implemented as appropriate.

Most recently, STS surgeon members have expressed interest in real-time, online data updates, which has led to the development of dashboard-type reporting on STS.org. Roll-out of the adult cardiac dashboard is underway in 2018.

Also, adult cardiac public reporting has been available since 2010 (http://publicreporting.sts.org/acsd), making star ratings for consenting participant groups available to participants as well as the public.

4a2.2.2. **Summarize the feedback obtained from those being measured.**
Please see response under 4a2.2.1

4a2.2.3. **Summarize the feedback obtained from other users**
Voluntary participation in ACSD public reporting has continually increased over the years that the initiative has been available, from 38% of ACSD participants in 2014, to 49% in 2016, to approximately 67% as of November 2018. This trend suggests that feedback from ACSD participants and others who access the performance data available on STS.org is sufficiently positive to promote ever-increasing participation in public reporting.

4a2.3. **Describe how the feedback described in 4a2.2.1 has been considered when developing or revising the measure specifications or implementation, including whether the measure was modified and why or why not.**
N/A

Improvement
Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

4b1. **Refer to data provided in 1b but do not repeat here. Discuss any progress on improvement (trends in performance results, number and percentage of people receiving high-quality healthcare; Geographic area and number and percentage of accountable entities and patients included.)**
If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial

endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

Looking at the overall temporal trend, the operative mortality rate has been steadily declining. The overall event rates in the last three 12-month periods were 1.24%, 1.09%, 1.03% (July 2014-June 2015, July 2015-June 2016, July 2016-June 2017, respectively).

Number of participants and operations by geographic regions, in July 2011 to June 2014 and in July 2014 to June 2017

July 2011 to June 2014						July 2014 to June 2017					
	Midwest	Northeast	Other region	South	West		Midwest	Northeast	Other region	South	West
# Participant	286	134	0	354	212	# Participant	273	138	7	361	214
% Participant	29.0%	13.6%	0.0%	35.9%	21.5%	% Participant	27.5%	13.9%	0.7%	36.4%	21.6%
# Operation	7146	5506	NA	8326	4716	# Operation	6771	6107	205	8274	5118
% Operation	27.8%	21.4%	NA%	32.4%	18.4%	% Operation	25.6%	23.1%	0.8%	31.3%	19.3%

*Other region: Ontario, Canada

(Please see Appendix if table does not display clearly above.)

4b2. Unintended Consequences

The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists).

4b2.1. **Please explain any unexpected findings (positive or negative) during implementation of this measure including unintended impacts on patients.**

All public reporting initiatives have the potential for unintended consequences, including gaming and risk aversion. We attempt to control the former through a careful audit process; 10% of STS Adult Cardiac Surgery Database participants were audited in 2018, as in each year since 2014. We control for risk aversion by having a robust methodology that appropriately adjusts the expected risk for providers who care for sicker patients.

4b2.2. **Please explain any unexpected benefits from implementation of this measure.**

5. Comparison to Related or Competing Measures

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.

5. Relation to Other NQF-endorsed Measures

Are there related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population)? If yes, list the NQF # and title of all related and/or competing measures.

Yes

5.1a. **List of related or competing measures (selected from NQF-endorsed measures)**

0119 : Risk-Adjusted Operative Mortality for CABG
0120 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR)
0121 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement
0122 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Replacement + CABG Surgery
0123 : Risk-Adjusted Operative Mortality for Aortic Valve Replacement (AVR) + CABG Surgery
1502 : Risk-Adjusted Operative Mortality for Mitral Valve (MV) Repair + CABG Surgery

5.1b. **If related or competing measures are not NQF endorsed please indicate measure title and steward.**

Also related and NQF-endorsed (not available with search function in 5.1a):

3031 Mitral Valve Repair/Replacement Composite Score

5a. Harmonization of Related Measures

The measure specifications are harmonized with related measures;

OR

The differences in specifications are justified

5a.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s):
Are the measure specifications harmonized to the extent possible?
Yes

5a.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.
N/A

5b. Competing Measures

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);

OR

Multiple measures are justified.

5b.1. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s):
Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)
N/A

Appendix

A.1 Supplemental materials may be provided in an appendix. All supplemental materials (such as data collection instrument or methodology reports) should be organized in one file with a table of contents or bookmarks. If material pertains to a specific submission form number, that should be indicated. Requested information should be provided in the submission form and required attachments. There is no guarantee that supplemental materials will be reviewed.
Attachment **Attachment:** 1501_Appendix-SQL-DCRI-Risk-Model-Fall2018.pdf

Contact Information

Co.1 Measure Steward (Intellectual Property Owner): The Society of Thoracic Surgeons
Co.2 Point of Contact: Mark, Antman, mantman@sts.org, 312-202-5856-
Co.3 Measure Developer if different from Measure Steward: The Society of Thoracic Surgeons
Co.4 Point of Contact: Mark, Antman, mantman@sts.org, 312-202-5856-

Additional Information

Ad.1 Workgroup/Expert Panel involved in measure development
Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.
The STS Quality Measurement Task Force (chaired by David Shahian, MD) is responsible for measure development. Members of the STS Task Force on Quality Initiatives provide clinical expertise as needed. The STS Workforce on National Databases meets at the STS Annual Meeting and reviews the measures on a yearly basis. Changes or updates to the measure will be at the recommendation of the Workforce.

Quality Measurement Task Force
David M. Shahian, MD, Chair; Massachusetts General Hospital & Harvard Medical School, Boston, MA
Diane Alejo; Johns Hopkins Univ., Baltimore, MD
Vinay Badhwar, MD; West Virginia University Hospitals, Morgantown, WV
Jordan Bloom, MD; Massachusetts General Hospital, Boston, MA
Michael Bowdish, MD; Torrance Memorial Medical Center, Los Angeles, CA

Joseph Cleveland, Jr., MD; University of Colorado Anschutz Medical Campus, Aurora, Co
Nimesh Desai, MD; Hospital of the University of Pennsylvania, Philadelphia, PA
James Edgerton, MD; Cardiac Surgery Specialists, Plano, TX
Fred Edwards, MD; University of Florida College of Medicine, Jacksonville, FL
Melanie Edwards, MD; Saint Joseph Mercy Health System, Ypsilanti, MI
Vic Ferraris, MD; University of Kentucky Medical Center, Lexington, KY
Anthony Furnary, MD; Providence Alaska Medical Center, Anchorage, AK
Joshua Goldberg, MD; Westchester Medical Center, Valhalla, NY
Jeffrey P. Jacobs, MD; All Children's Hospital/John Hopkins University, Saint Petersburg, FL
Marshall Jacobs, MD; Johns Hopkins Cardiac Surgery, Baltimore, MD
Karen Kim, MD; Univ. of Michigan Hospitals & Health Centers, Ann Arbor, MI
Benjamin Kozower, MD; Washington University School of Medicine, St. Louis, MO
Paul Kurlansky, MD; Columbia HeartSource/Columbia University Medical Center, New York, NY
Kevin Lobdell, MD; Atrium Health, Charlotte, NC
Mitchell Magee, MD; Southwest Cardiothoracic Surgeons, Dallas, TX
Gaetano Paone, MD; Henry Ford Hospital, Detroit, MI
J. Scott Rankin, MD; WVU Heart & Vascular Institute, West Virginia University, Morgantown, WV
Charles Schwartz, MD; St. Joseph Mercy Hospital, Pontiac, MI
Vinod Thourani, MD; MedStar Washington Hospital Center, Washington, DC
Christina Vassileva, MD; U Mass Memorial Medical Center, Worcester, MA
Moritz Wyler von Ballmoos, MD; Houston Methodist DeBakey Heart & Vascular Center, Houston, TX
Sean M. O'Brien, PhD; Duke Clinical Research Institute, Durham, NC

Task Force on Quality Initiatives
Gaetano Paone, MD, Chair; Henry Ford Hospital, Detroit, MI
William Caine, MD; Intermountain Heart Institute, Murray, UT
Chris Feindel, MD; Cardiovascular Surgery Associates, Toronto, Ontario
Kristopher George, MD; Cardiac Surgical Associates of Fresno, Fresno, CA
Kevin Lobdell, MD; Atrium Health, Charlotte, NC
Edward Savage, MD; Cleveland Clinic/Martin Health, Stuart, FL

Measure Developer/Steward Updates and Ongoing Maintenance

Ad.2 **Year the measure was first released:** 2004
Ad.3 **Month and Year of most recent revision:** 07, 2017
Ad.4 **What is your frequency for review/update of this measure?** annually
Ad.5 **When is the next scheduled review/update for this measure?** 2019

Ad.6 **Copyright statement:**
Ad.7 **Disclaimers:**

Ad.8 **Additional Information/Comments:**