



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 #: 2683

Corresponding Measures:

De.2. Measure Title: Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery

Co.1.1. Measure Steward: The Society of Thoracic Surgeons

De.3. Brief Description of Measure: Risk-adjusted percent of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

1b.1. Developer Rationale: Congenital heart disease is a common birth defect that affects approximately 1 in 125 live births [1]. Pediatric and congenital heart surgery is a subspecialty of high resource utilization that has the potential to repair or palliate the majority of patients with pediatric and congenital cardiac disease. Mortality is likely the single most important negative outcome that can be associated with a surgical procedure. 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 by improving the structure and processes of pediatric and congenital cardiac surgery including preoperative and postoperative care as well as intraoperative techniques. Over the past decade, mortality after pediatric cardiac surgery has been declining [2] and currently stands at 3.4%.

Since 2015, STS has publicly reported risk adjusted Operative Mortality [3, 4, 5, 6] stratified by the STAT Mortality Categories [7, 8, 9, 10, 11, 12].

1. Tchervenkov CI, Jacobs JP, Bernier P-L, et al. The improvement of care for paediatric and congenital cardiac disease across the World: a challenge for the World Society for Pediatric and Congenital Heart Surgery. *Cardiol Young*. 2008;18:63-9.
2. Jacobs JP, He X, Mayer JE Jr, Austin EH 3rd, Quintessenza JA, Karl TR, Vricella L, Mavroudis C, O'Brien SM, Pasquali SK, Hill KD, Husain SA, Overman DM, St Louis JD, Han JM, Shahian DM, Cameron D, Jacobs ML. Mortality Trends in Pediatric and Congenital Heart Surgery: An Analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database. *Ann Thorac Surg*. 2016 Oct;102(4):1345-52. doi: 10.1016/j.athoracsur.2016.01.071. Epub 2016 Aug 31. PMID: 27590683.
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8. Jacobs JP, Jacobs ML. Transparency and Public Reporting of Pediatric and Congenital Heart Surgery Outcomes in North America. *World J Pediatr Congenit Heart Surg*. 2016 Jan;7(1):49-53. doi: 10.1177/2150135115619161. PMID: 26714994.
 9. Jacobs JP. Public reporting in congenital heart surgery: Has the time come? Yes or no? *Progress in Pediatric Cardiology* 42 (September 2016) 13–16. <http://dx.doi.org/10.1016/j.ppedcard.2016.02.009>.
 10. Shahian DM, Jacobs JP, Badhwar V, D'Agostino RS, Bavaria JE, Prager RL. Risk Aversion and Public Reporting. Part 1: Observations From Cardiac Surgery and Interventional Cardiology. *Ann Thorac Surg*. 2017 Dec;104(6):2093-2101. doi: 10.1016/j.athoracsur.2017.06.077. Epub 2017 Nov 1. PMID: 29100643.
 11. Shahian DM, Jacobs JP, Badhwar V, D'Agostino RS, Bavaria JE, Prager RL. Risk Aversion and Public Reporting. Part 2: Mitigation Strategies. *Ann Thorac Surg*. 2017 Dec;104(6):2102-2110. doi: 10.1016/j.athoracsur.2017.06.076. Epub 2017 Nov 1. PMID: 29100640.
 12. Jacobs JP, Shahian DM, Prager RL, Badhwar V, Jacobs ML. Invited Commentary. Parents' Preferences Regarding Public Reporting of Outcomes in Congenital Heart Surgery. *Ann Thorac Surg*. 2018 Feb;105(2):612-614. doi: 10.1016/j.athoracsur.2017.05.057. PMID: 29362174. Congenital heart disease is a common birth defect that affects approximately 1 in 125 live births. Pediatric and congenital heart surgery is a subspecialty of high resource utilization that has the potential to repair or palliate the majority of patients with pediatric and congenital cardiac disease. Mortality is likely the single most important negative outcome that can be associated with a surgical procedure. 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. Over the past decade, mortality after pediatric cardiac surgery has been declining and currently stands at 3.4%.
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 - Jacobs ML, Jacobs JP, Jenkins KJ, Gauvreau K, Clarke DR, Lacour-Gayet FL. Stratification of complexity: The Risk Adjustment for Congenital Heart Surgery-1 Method and The Aristotle Complexity Score – past, present, and future. *Cardiol Young*. 2008;18:163-8.
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 - O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, et al. An empirically based tool for analyzing mortality associated with congenital heart surgery. *J Thorac Cardiovasc Surg*. 2009;138:1139-53.
 - Jacobs JP, Jacobs ML, Lacour-Gayet FG, et al. Stratification of Complexity Improves Utility and Accuracy of Outcomes Analysis in a Multi-institutional Congenital Heart Surgery Database – Application of the RACHS-1 and Aristotle Systems in the STS Congenital Heart Surgery Database. *Pediatr Cardiol*. 2009;30:1117-30.
 - O'Brien SM, Jacobs JP, Pasquali SK et al. The STS Congenital Heart Surgery Database Mortality Risk Model: Part 1 – Statistical Methodology; this manuscript is currently being reviewed for publication.
 - Jacobs JP, O'Brien SM, Pasquali SK et al. The STS Congenital Heart Surgery Database Mortality Risk Model: Part 2 - Clinical Application; this manuscript is currently being reviewed for publication.
 - Pasquali SK, Jacobs ML, Gaynor J et al. Characteristics of Patients Undergoing Congenital Heart Surgery Vary Across US Children's Hospitals and Impact Assessment of Hospital Performance: An Analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database; this manuscript is currently being prepared for submission to The Annals of Thoracic Surgery.

S.4. Numerator Statement: Number of patients undergoing index pediatric and/or congenital heart surgery who die, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, even if after 30 days (including patients transferred to other acute care facilities), and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure

S.6. Denominator Statement: All patients undergoing index pediatric and/or congenital heart surgery

S.8. Denominator Exclusions: - Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure.

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

De.1. Measure Type: Outcome

<p>S.17. Data Source: Registry Data</p> <p>S.20. Level of Analysis: Clinician : Group/Practice</p>
<p>IF Endorsement Maintenance – Original Endorsement Date: Sep 03, 2015 Most Recent Endorsement Date: Oct 24, 2019</p>
<p>IF this measure is included in a composite, NQF Composite#/title:</p> <p>IF this measure is paired/grouped, NQF#/title:</p> <p>De.4. IF PAIRED/GROUPED, what is the reason this measure must be reported with other measures to appropriately interpret results?</p>

<p>1. Evidence, Performance Gap, Priority – Importance to Measure and Report</p>
<p>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.</p>
<p>1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form 2683_evid_attmt_Spring2019.docx</p> <p>1a.1 For Maintenance of Endorsement: 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</p>
<p>1b. Performance Gap Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating:</p> <ul style="list-style-type: none"> considerable variation, or overall less-than-optimal performance, in the quality of care across providers; and/or Disparities in care across population groups. <p>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) <i>If a COMPOSITE (e.g., combination of component measure scores, all-or-none, any-or-none), SKIP this question and answer the composite questions.</i></p> <p>Congenital heart disease is a common birth defect that affects approximately 1 in 125 live births [1]. Pediatric and congenital heart surgery is a subspecialty of high resource utilization that has the potential to repair or palliate the majority of patients with pediatric and congenital cardiac disease. Mortality is likely the single most important negative outcome that can be associated with a surgical procedure. 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 by improving the structure and processes of pediatric and congenital cardiac surgery including preoperative and postoperative care as well as intraoperative techniques. Over the past decade, mortality after pediatric cardiac surgery has been declining [2] and currently stands at 3.4%.</p> <p>Since 2015, STS has publicly reported risk adjusted Operative Mortality [3, 4, 5, 6] stratified by the STAT Mortality Categories [7, 8, 9, 10, 11, 12].</p> <ol style="list-style-type: none"> 1. Tchervenkov CI, Jacobs JP, Bernier P-L, et al. The improvement of care for paediatric and congenital cardiac disease across the World: a challenge for the World Society for Pediatric and Congenital Heart Surgery. <i>Cardiol Young</i>. 2008;18:63-9. 2. Jacobs JP, He X, Mayer JE Jr, Austin EH 3rd, Quintessenza JA, Karl TR, Vricella L, Mavroudis C, O'Brien SM, Pasquali SK, Hill KD, Husain SA, Overman DM, St Louis JD, Han JM, Shahian DM, Cameron D, Jacobs ML. Mortality Trends in Pediatric and Congenital Heart Surgery: An Analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database. <i>Ann Thorac Surg</i>. 2016 Oct;102(4):1345-52. doi: 10.1016/j.athoracsur.2016.01.071. Epub 2016 Aug 31. PMID: 27590683. 3. O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, et al. An empirically based tool for analyzing mortality associated with congenital heart surgery. <i>J Thorac Cardiovasc Surg</i>. 2009;138:1139-53. 4. O'Brien SM, Jacobs JP, Pasquali SK, Gaynor JW, Karamlou T, Welke KF, Filardo G, Han JM, Kim S, Shahian DM, Jacobs ML. The Society of Thoracic Surgeons Congenital Heart Surgery Database Mortality Risk Model: Part 1-Statistical Methodology. <i>Ann</i>

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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 STS Congenital Heart Surgery Database currently represents >90% of all US centers performing congenital heart surgery. Pre-operative, operative and outcomes data are collected on all patients undergoing pediatric and congenital heart surgery at participating centers. Coding is performed by clinicians and trained data managers using the International Pediatric and Congenital Cardiac Code. Data quality and reliability are evaluated through intrinsic verification of data (e.g. identification and correction of missing/out of range values and inconsistencies in values across fields), and a formal process of site visits and data audits at ~10% of participating institutions annually. The Duke Clinical Research Institute serves as the data warehouse and analysis center for all of the STS National Databases.

The model's target population includes patients of all ages undergoing a congenital cardiac operation with or without cardiopulmonary bypass. Both pediatric and adult patients are included in order to allow assessing outcomes across each institution's entire case mix. The analysis is limited to procedure types that have been assigned to a STAT Mortality Category and only the first (index) cardiac operation of each hospital admission is analyzed. Participating sites are excluded if they have >10% missing data for key covariates (preoperative factors, non-cardiac abnormalities, genetic syndromes, prior cardiothoracic operations, prematurity) or have >10% missing or unknown operative mortality status. In addition, participating sites must have =10% missing mortality data for operations performed in 2015, =5% missing mortality data for operations performed in 2016, and =2% missing mortality data for operations performed in 2017 or later. At the patient level, the analysis excludes operations on infants <2.5 kg undergoing isolated ductus arteriosus ligation, patients with missing or invalid data for key variables (operative mortality, age, sex, or weight), records collected under an obsolete data collection form prior to STS version 3.0.

For the current NQF update, we used STS data from two 4-year time periods:

- Time Period #1. January 1, 2010 – December 31, 2013 (4 years)
 - o N = 52,224 operations
 - o N = 86 participants
- Time Period #2. July 1, 2014 – June 30, 2018 (4 years)
 - o N = 89,677 operations
 - o N = 105 participants

Note: Results for Time Period #1 are from our prior submission of this measure in 2015.

Each participant's expected mortality rate was obtained by averaging the predicted probability of death according to the model across all patients at the participant who met the measure's inclusion and exclusion criteria. The O/E ratio was then calculated as $O/E = (\text{actual observed mortality rate}) / (\text{expected mortality rate})$. A 95% confidence interval CI for the O/E ratio was calculated by treating the observed number of deaths as a binomial random variable and treating the expected number of deaths as constant. An O/E ratio > 1.0 implies that the participant had more deaths than was expected in light of the participant's case mix whereas an O/E ratio < 1.0 implies that the number of deaths was fewer than expected in light of the participant's case mix.

Distribution of Participant-Specific Observed-to-Expected (O/E) Ratios

Time Period #1. Jan 2010 – Dec 2013

	# of sites	Mean	Std. Dev.	Range	Inter-Quartile Range							
				Min	Max	25%	75%					
All sites	86	1.13	0.58	0.00	3.70	0.79	1.36					
Sites with = 100 eligible records				78	1.17	0.55	0.25	3.70	0.79	1.35		
Sites with = 200 eligible records				64	1.08	0.35	0.51	1.98	0.79	1.3		
Percentiles												
	10%	20%	30%	40%	50%	60%	70%	80%	90%			
All sites	0.65	0.73	0.84	0.95	1.05	1.18	1.3	1.44	1.73			
Sites with = 100 eligible records				0.68	0.76	0.85	0.96	1.07	1.18	1.3	1.42	1.75
Sites with = 200 eligible records				0.68	0.76	0.84	0.95	1.04	1.12	1.26	1.34	1.58

Time Period #2. Jul 2014 – Jun 2018

	# of sites	Std. Dev.		Range Min	Inter-Quartile Range			25%	75%
		Mean	Dev.		Max	25%	75%		
All sites	105	1.1	0.44	0	2.28	0.76	1.34		
Sites with = 100 eligible records				99	1.1	0.43	0.25	2.28	0.76 1.33
Sites with = 200 eligible records				94	1.1	0.44	0.25	2.28	0.76 1.33

	Percentiles									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	
All sites	0.59	0.74	0.85	0.94	1.08	1.21	1.31	1.44	1.71	
Sites with = 100 eligible records				0.59	0.74	0.85	0.94	1.07	1.2	1.29 1.4 1.71
Sites with = 200 eligible records				0.59	0.74	0.85	0.94	1.08	1.22	1.29 1.4 1.71

If tables do not display clearly in this field, please see Appendix

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.

Disparities by race and ethnicity were analyzed using data from two 4-year time periods (Time Period #1: January 2010 – December 2013 and Time Period #2: July 2014 – Jun 3018). For a description of the data source please see Section 1b.2. Disparities by insurance status were analyzed using the subset of records from Time Period #2 that were collected under version 3.3 of the STS data collection form (surgery dates January 1, 2016 – June 30, 2018; N = 55,604 records; N = 103 participants).

Differences in risk-adjusted mortality by race and ethnicity were assessed in each time period by adding indicator variables for race and ethnicity to the risk adjustment model.

Differences in risk adjusted mortality across categories of primary payor (none/self-pay, Medicaid, other) were analyzed by re-estimating the risk-adjustment model after adding indicator variables for primary payer using the subset of data collected under Version 3.3 of the data collection form.

Multivariable odds ratios for race, Hispanic ethnicity, and insurance type are summarized below. These variables were not considered for inclusion in the regression model due to NQF's policy at the time of developing the model.

Disparities by Race/Ethnicity: Time Period #1 (Jan 2010 – Dec 2013)

Population Group	Odds Ratio (95% CI)	P-value
Asian	1.06 (0.82, 1.37)	0.65
Black	1.46 (1.28, 1.66)	<.0001
Native American	0.73 (0.44, 1.21)	0.23
Native pacific / Hawaiian	1.40 (0.82, 2.36)	0.21
Other race	1.03 (0.88, 1.21)	0.73
Hispanic ethnicity	0.98 (0.85, 1.13)	0.78

Disparities by Race/Ethnicity: Time Period #2 (Jul 2014 – Jun 2018)

Population Group	Odds Ratio (95% CI)	P-value
Asian	1.19 (0.97, 1.47)	0.10
Black	1.32 (1.18, 1.49)	<.0001
Native American	1.49 (1.03, 2.15)	0.03
Native pacific / Hawaiian	0.81 (0.46, 1.41)	0.45
Other race	1.12 (0.98, 1.28)	0.11
Hispanic ethnicity	1.13 (1.01, 1.27)	0.03

Disparities by Insurance Status: Time Period #2 (Jul 2014 – Jun 2018) Subset of Records Collected Under Data Version 3.3.

Insurance Status	Odds Ratio (95% CI)	P-value
None / Self-Pay (versus commercial/government/other)	1.52 (1.07, 2.15)	0.02
Medicaid (versus commercial/government other)	1.09 (0.97, 1.23)	0.13

Note: Comparisons of unadjusted mortality are not presented as these are confounded by differences case mix including the types of lesions and associated procedures.

If tables do not display clearly in this field, please see Appendix

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):

Children, Populations at Risk : Individuals with multiple chronic conditions

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.)

http://www.sts.org/sites/default/files/documents/pdf/ndb/CongenitalDataCollectionForm3_0_Annotated_20090916.pdf;

http://www.sts.org/sites/default/files/documents/pdf/CongenitalDataSpecificationsV3_0_20090904.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)

No data dictionary Attachment:

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.

N/A

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

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

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

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

S.6. Denominator Statement (Brief, narrative description of the target population being measured)

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

<p>S.8. Denominator Exclusions <i>(Brief narrative description of exclusions from the target population)</i></p> <p>- Patients weighing less than or equal to 2,500 grams undergoing isolated patent arterial duct (PDA) ligation as their primary procedure are excluded. We acknowledge that mortality after surgical PDA closure in low-birth weight premature infants can be related to surgical judgment or technique; however, the vast majority of deaths in this patient population are multi-factorial and largely unrelated to the surgical procedure in time and by cause. Therefore, because mortality in this patient group could potentially impact significantly on the expression of overall programmatic mortality, a decision was made to exclude from mortality analysis patients weighing less than or equal to 2,500 g undergoing PDA ligation as their primary procedure.</p> <p>- All operations where the primary procedure is either pectus repair or bronchoscopy are not classified as cardiac operations (i.e., they are thoracic procedures) and thus, they are excluded from the denominator</p> <p>S.9. Denominator Exclusion Details <i>(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.)</i></p> <p>Weight in kilograms [WeightKg (STS Congenital Heart Surgery Database Version 3.0)] = 2.5 kg and primary procedure (PrimProc) is marked “1330 = PDA closure, Surgical”; primary procedure (PrimProc) is marked “1430 = Pectus repair” or “1870 = Bronchoscopy”</p>
<p>S.10. Stratification Information <i>(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.)</i></p> <p>N/A</p> <p>S.11. Risk Adjustment Type (Select type. Provide specifications for risk stratification in measure testing attachment)</p> <p>Statistical risk model</p> <p>If other:</p>
<p>S.12. Type of score:</p> <p>Rate/proportion</p> <p>If other:</p> <p>S.13. Interpretation of Score <i>(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)</i></p> <p>Better quality = Lower score</p> <p>S.14. Calculation Algorithm/Measure Logic <i>(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.)</i></p> <p>Please refer to numerator and denominator sections for detailed information.</p>
<p>S.15. Sampling <i>(If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)</i></p> <p>IF an instrument-based performance measure (e.g., PRO-PM), identify whether (and how) proxy responses are allowed.</p> <p>N/A</p> <p>S.16. Survey/Patient-reported data <i>(If measure is based on a survey or instrument, provide instructions for data collection and guidance on minimum response rate.)</i></p> <p>Specify calculation of response rates to be reported with performance measure results.</p> <p>N/A</p>
<p>S.17. Data Source <i>(Check ONLY the sources for which the measure is SPECIFIED AND TESTED).</i></p> <p>If other, please describe in S.18.</p> <p>Registry Data</p> <p>S.18. Data Source or Collection Instrument <i>(Identify the specific data source/data collection instrument (e.g. name of database, clinical registry, collection instrument, etc., and describe how data are collected.)</i></p> <p>IF instrument-based, identify the specific instrument(s) and standard methods, modes, and languages of administration.</p> <p>STS Congenital Heart Surgery Database Version 3.0; STS Congenital Heart Surgery Database Version 3.22 went live on January 1,</p>

2014.

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

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

testing_v7.1_-_2683_Op-Mortal-Ped-Congen-Ht-Surg-636910401008989389.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.

No

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).

The STS Congenital Heart Surgery Database currently represents >90% of all US centers performing congenital heart surgery, 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 Congenital Heart Surgery Database in electronic format following a standard set of data specifications. The majority of participating institutions obtain data entry software products that are certified for the purposes of collecting STS Congenital Heart Surgery Database data elements.

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 Congenital Heart Surgery Database for at least 8 years and some of them have been part of the database for more than 15 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 and maintain the measure included volunteer cardiothoracic surgeon time, STS staff time, and Duke Clinical Research Institute statistician and project management time.

Other fees:

The participation fee for the STS Congenital Heart Surgery Database is \$4,000 per year if a majority of participating physicians at an institution or practice are STS members and \$5,000 per year if a majority of participating physicians at an institution or practice are not STS members. In addition, there is a volume-based fee of \$3.00 per patient record submitted as part of any data harvest to the data warehouse.

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 Please see 4a.1 below https://publicreporting.sts.org/chsd Please see 4a.1 below https://publicreporting.sts.org/chsd Quality Improvement (Internal to the specific organization) STS Congenital Heart Surgery Database https://www.sts.org/registries-research-center/sts-national-database/sts-congenital-heart-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

Participants in the STS Congenital Heart Surgery Database (CHSD) receive periodic feedback reports on their data (an internal quality improvement initiative), and data (as listed below) from the CHSD has been publicly reported since January 2015. Approximately 23% of CHSD participants were enrolled in the first round of voluntary public reporting in 2015; participation in this initiative has grown to over 83% as of April 2019. For all participants that consent to participate in voluntary public reporting, STS reports:

- Overall volume and volume by STAT category
- The overall operative mortality rate for each participant over a four-year period for all ages
- The operative mortality rate for each participant over a four-year period for each of the 5 Society of Thoracic Surgeons - European Association for Cardio-Thoracic Surgery Congenital Heart Surgery Mortality Categories (STAT Mortality Categories).

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?)

N/A

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 December 2017, more than 100 surgical participant groups in the U.S. and Canada (plus other international participants) submit surgical quality data to the STS Congenital Heart Surgery Database (CHSD). The CHSD contains more than 450,000 congenital

heart surgery procedure records and currently has nearly 400 participating physicians (surgeons and anesthesiologists).

CHSD participants submit their data to the STS data warehouse during two submission periods (“harvests”) each year, through a secure website. Participants receive an initial report on their data quality within a few days of data submission; after review and resubmission of the data file, participants are provided with secure access to their final performance report within three months of the harvest close date. Performance results for each measure include a summary of the results of all participants who were included in the analysis. The participant’s score is illustrated graphically in relation to the 25th, 50th and 75th percentiles of the distribution across participants, and is accompanied by the 95% Bayesian credible interval. In addition, these risk-adjusted results allow surgeons to compare their patients’ outcomes with national benchmarks and to initiate QI efforts as needed. Resources are available on the STS website and through contact with STS Database staff to assist participants with interpretation of their performance results.

Additionally, all U.S. and Canadian participants in the CHSD have the opportunity to consent to the public reporting of a subset of their performance results on the STS website, making “star ratings” available to consenting participants as well as the public. As of April 2019, 117 surgical participant groups in the U.S. and Canada (plus other international participants) submit surgical quality data to the STS Congenital Heart Surgery Database (CHSD). The CHSD contains more than 475,000 congenital heart surgery procedure records and currently has more than 1,000 participating physicians (surgeons and anesthesiologists).

CHSD participants submit their data to the STS data warehouse during two submission periods (“harvests”) each year, through a secure website. Participants receive an initial report on their data quality within a few days of data submission; after review and resubmission of the data file, participants are provided with secure access to their final performance report within three months of the harvest close date. Performance results for each measure include a summary of the results of all participants who were included in the analysis. The participant’s score is illustrated graphically in relation to the 25th, 50th and 75th percentiles of the distribution across participants, and is accompanied by the 95% Bayesian credible interval. In addition, these risk-adjusted results allow surgeons to compare their patients’ outcomes with national benchmarks and to initiate QI efforts as needed. Resources are available on the STS website and through contact with STS Database staff to assist participants with interpretation of their performance results.

Additionally, all U.S. and Canadian participants in the CHSD have the opportunity to consent to the public reporting of a subset of their performance results on the STS website, making “star ratings” available to consenting participants as well as the public.

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.

See 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 congenital heart surgeons from across the U.S. who comprise the STS Congenital Heart Surgery Task Force meet periodically to discuss the participant reports and to consider potential enhancements to the CHSD. 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. The congenital heart surgery dashboard launched in 2018.

The STS also convenes a Public Reporting Task Force to review feedback on STS public reporting, to promote greater participation among STS members, and to review and enhance the usability of the format of public reporting on the STS website.

4a2.2.2. Summarize the feedback obtained from those being measured.

Feedback from CHSD participant groups is positive, as evidenced by the fact that 95% of all hospitals performing congenital heart surgery in the U.S. and Canada participate in the CHSD, and by the continual expansion of CHSD public reporting – from 33% of participants in mid-2015 to over 83% as of April 2019. The STS also receives and, to a limited extent, accommodates requests from third parties for access to STS public reporting data and “star ratings” for independent public reporting initiatives.

4a2.2.3. Summarize the feedback obtained from other users

See 4a2.2.2

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.

The STS Congenital Heart Surgery Task Force did not identify a need to modify this measure in 2018.

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.

To explore improvement over time, we examined the aggregated outcomes of all hospitals combined within each of the following 1-year time intervals:

- Year 1: July 1, 2014 – June 30, 2015
- Year 2: July 1, 2015 – June 30, 2016
- Year 3: July 1, 2016 – June 30, 2017
- Year 4: July 1, 2017 – June 30, 2018

As shown in the table, the observed mortality rate decreased from 3.01% in Year 1 to 2.55% in Year 4 whereas the expected mortality rate increased from 2.71% in Year 1 to 2.86% in Year 4. The fact that expected mortality rate increased over time suggests that the improvement in observed mortality over time was not explained by a lower-risk case mix. The aggregate O/E ratio decreased from 1.11 (95% CI 1.03 to 1.19) in Year 1 to 0.89 (95% CI 0.82 to 0.96) in Year 4. The non-overlapping confidence intervals indicates that the difference was unlikely to be explained by chance variation.

Time Period	# of participants	# of records	Mortality			
			Observed (O)		Expected (E)	O/E (95% CI)
Year 1: 7/2014-6/2015	103	22562	3.01%	2.71%	1.11 (1.03, 1.19)	
Year2: 7/2015-6/2016	102	22802	3.09%	2.85%	1.08 (1.00, 1.16)	
Year 3: 7/2016-6/2017	103	22711	2.76%	2.87%	0.96 (0.89, 1.04)	
Year 4: 7/2017-6/2018	102	21602	2.55%	2.86%	0.89 (0.82, 0.96)	

If tables do not display clearly in this field, please see Appendix

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.

We are not aware of any negative unintended consequences. 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 (in 2018, 10% of participants were audited) and the latter 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)

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

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

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?

No

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

Measure 0339 is based on administrative data while the STS measure is based on clinical registry data.

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.)

Differences between Clinical and Administrative Nomenclature –

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

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

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

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

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

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

References

1. Cronk CE, Malloy ME, Pelech AN, et al. Completeness of state administrative databases for surveillance of congenital heart disease. *Birth Defects Res A Clin Mol Teratol* 2003;67:597-603.
2. Frohnert BK, Lussky RC, Alms MA, Mendelsohn NJ, Symonik DM, Falken MC. Validity of hospital discharge data for identifying infants with cardiac defects. *J Perinatol* 2005;25:737-42.
3. Strickland MJ, Riehle-Colarusso TJ, Jacobs JP, Reller MD, Mahle WT, Botto LD, Tolbert PE, Jacobs ML, Lacour-Gayet FG, Tchervenkov CI, Mavroudis C, Correa A. The importance of nomenclature for congenital cardiac disease: implications for research and evaluation. In: 2008 Supplement to *Cardiology in the Young: Databases and The Assessment of Complications associated with The Treatment of Patients with Congenital Cardiac Disease*, Prepared by: The Multi-Societal Database Committee for Pediatric and Congenital Heart Disease, Jeffrey P. Jacobs, MD (editor). *Cardiology in the Young*. 2008 Dec 9; 18(Suppl 2):92-100.
4. Pasquali SK, Peterson ED, Jacobs JP, He X, Li JS, Jacobs ML, Gaynor JW, Hirsch JC, Shah SS, Mayer JE. Differential case ascertainment in clinical registry versus administrative data and impact on outcomes assessment for pediatric cardiac operations. *Ann Thorac Surg*. 2013 Jan;95(1):197-203. doi: 10.1016/j.athoracsur.2012.08.074. Epub 2012 Nov 7. PMID: 23141907.

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:** [2683_Appendix-2019.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

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Measure Developer/Steward Updates and Ongoing Maintenance

Ad.2 Year the measure was first released: 2014

Ad.3 Month and Year of most recent revision: 01, 2015

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? 01, 2020

Ad.6 Copyright statement:

Ad.7 Disclaimers:

Ad.8 Additional Information/Comments: