

# NATIONAL QUALITY FORUM

## National Voluntary Consensus Standards for Pediatric Cardiac Surgery Measures

**Measure Number:** PCS-018-09

**Measure Title:** Operative Mortality Stratified by the Five STS-EACTS Mortality Levels

**Description:** Operative mortality stratified by the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool

**Numerator Statement:** Number of patients who undergo pediatric and congenital open heart surgery and die during either of the following two time intervals:

1. Prior to hospital discharge
2. Within 30 days of the date of surgery

**Denominator Statement:** Number of index cardiac operations in each level of complexity stratification using the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool

**Level of Analysis:** Group of clinicians, Facility, Integrated delivery system, Health plan, Community/Population

**Data Source:** Electronic Health/Medical Record, Electronic Clinical Database (The Society of Thoracic Surgeons Congenital Heart Surgery Database), Electronic Clinical Registry (The Society of Thoracic Surgeons Congenital Heart Surgery Database), Electronic Claims, Paper Medical Record

**Measure Developer:** The Society of Thoracic Surgeons

**Type of Endorsement:** Recommended for Endorsement (Steering Committee Vote, Yes-8, No-1, Abstain-0)

**Attachments:** "STS Attachment: Procedure Code Definitions" & "STS Data Collection Tool"

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| <b>PCS-018-09<br/>Operative<br/>Mortality<br/>Stratified<br/>by the Five<br/>STS-EACTS<br/>Mortality<br/>Levels<br/>(Society of<br/>Thoracic<br/>Surgeons)</b> | <p><b><u>Recommendation:</u></b> Endorsement Yes-8; No-1; Abstain-0</p> <p><b><u>Final Measure Evaluation Ratings:</u></b> <b>I:</b> Y-9; N-0    <b>S:</b> H-8; M-1; L-0    <b>U:</b> H-6; M-2; L-0    <b>F:</b> H-8; M-1; L-0</p> <p><b><u>Discussion:</u></b><br/> <b>I:</b> Understanding comparative mortality across institutions following congenital and pediatric cardiac surgery is immensely important.<br/> <b>S:</b> At NQF's request to standardize this measure, one method of risk stratification was selected by the developer. The capture of post-discharge mortality, especially for distant referrals needs to be assured for this measure to work. This measure requires use of STS codes. Similar to the concerns expressed above for the process measures regarding the selection of STS codes, this also applies for this outcome measures as they share the same code set. STS-EACTS mortality score is based mostly on actual data that have been assessed by the STS and EACTS databases.<br/> <b>U:</b></p> |
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## National Voluntary Consensus Standards for Pediatric Cardiac Surgery Measures

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|  | <b>F:</b> There is the need to use the STS-EACTS database to generate the measure and determine complexity levels. |
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# THE NATIONAL QUALITY FORUM

## MEASURE SUBMISSION FORM VERSION 3.1

March 2009

The measure information you submit will be shared with NQF's Steering Committees and Technical Advisory Panels to evaluate measures against the NQF criteria of importance to measure and report, scientific acceptability of measure properties, usability, and feasibility. Four conditions (as indicated below) must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards. Not all acceptable measures will be strong—or equally strong—among each set of criteria. The assessment of each criterion is a matter of degree; however, all measures must be judged to have met the first criterion, *importance to measure and report*, in order to be evaluated against the remaining criteria. References to the specific measure evaluation criteria are provided in parentheses following the item numbers. Please refer to the *Measure Evaluation Criteria* for more information at [www.qualityforum.org](http://www.qualityforum.org) under Core Documents. Additional guidance is being developed and when available will be posted on the NQF website.

Use the tab or arrow (↓→) keys to move the cursor to the next field (or back ←↑). There are three types of response fields:

- drop-down menus - select one response;
- check boxes - check as many as apply; and
- text fields - you can copy and paste text into these fields or enter text; these fields are not limited in size, but in most cases, we ask that you summarize the requested information.

Please note that URL hyperlinks do not work in the form; you will need to type them into your web browser.

**Be sure to answer all questions. Fields that are left blank will be interpreted as no or none. Information must be provided in this form. Attachments are not allowed except to provide additional detail or source documents for information that is summarized in this form.** If you have important information that is not addressed by the questions, they can be entered into item #46 near the end of the form.

**For questions about this form, please contact the NQF Project Director listed in the corresponding call for measures.**

| CONDITIONS FOR CONSIDERATION BY NQF |                                                                                                                                                                                                                                                                                      |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <i>Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards.</i>                                                                                                                                        |
| <b>A</b><br>(A)                     | Public domain or Measure Steward Agreement signed: <i>Agreement signed and submitted (If no, do not submit)</i><br>Template for the Measure Steward Agreement is available at <a href="http://www.qualityforum.org">www.qualityforum.org</a> under Core Documents.                   |
| <b>B</b><br>(B)                     | Measure steward/maintenance: Is there an identified responsible entity and process to maintain and update the measure on a schedule commensurate with clinical innovation, but at least every 3 years?<br><i>Yes, information provided in contact section (If no, do not submit)</i> |
| <b>C</b><br>(C)                     | Intended use: Does the intended use of the measure include BOTH public reporting AND quality improvement? <i>Yes (If no, do not submit)</i>                                                                                                                                          |
| <b>D</b><br>(D)                     | Fully developed and tested: Is the measure fully developed AND tested? <i>Yes, measure is fully tested and developed (If not tested and no plans for testing within 24 months, do not submit)</i>                                                                                    |

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## MEASURE SUBMISSION FORM VERSION 3.1

March 2009

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|           | (for NQF staff use) NQF Review #: PCS-018-09 NQF Project: Pediatric Cardiac Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | <b>MEASURE SPECIFICATIONS &amp; DESCRIPTIVE INFORMATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1         | Information current as of (date- MM/DD/YY): 7/21/10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2         | Title of Measure: Operative Mortality Stratified by the Five STS-EACTS Mortality Levels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3         | Brief description of measure <sup>1</sup> : Operative mortality stratified by the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4<br>(2a) | <p><b>Numerator Statement:</b> Number of patients who undergo pediatric and congenital open heart surgery and die during either of the following two time intervals:</p> <ol style="list-style-type: none"> <li>1. Prior to hospital discharge</li> <li>2. Within 30 days of the date of surgery</li> </ol> <p><b>Time Window:</b> One year (12 months) and 4 years (48 months); Tracked at one-year and four-year time intervals</p> <p><b>Numerator Details</b> (Definitions, codes with description):<br/>Reference:<br/>Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STS Congenital Database Committee. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5<br>(2a) | <p><b>Denominator Statement:</b> Number of index cardiac operations in each level of complexity stratification using the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool</p> <p><b>Time Window:</b> One year (12 months) and 4 years (48 months); Tracked at one-year and four-year time intervals</p> <p><b>Denominator Details</b> (Definitions, codes with description):<br/>As demonstrated in the following publication (STS Attachment 1 (of 2) - O'Brien et al, JTCVS, Nov 2009), the five STS-EACTS Mortality Levels constitute an objective and empirically based tool for complexity stratification. In addition, it represents an improvement over existing consensus-based tools.</p> <p>O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. <b>An empirically based tool for analyzing mortality associated with congenital heart surgery.</b> The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.</p> <p><b>Definition:</b> The number of patients who undergo pediatric and congenital Cardiac Operation - Cardiac operations are defined as operations that are of operation types of "CPB" or "No CPB Cardiovascular". (CPB is cardiopulmonary bypass.) [1].</p> <p><b>Definition:</b> The number of index cardiac operations in each level of complexity stratification using the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool.</p> <p>The following are STS procedure codes for pediatric and congenital cardiac operations per the STS Congenital Heart Surgery Database Version 3.0 Data Specifications. Analysis should include any index operation performed with any of the following component procedures on a patient with pediatric and/or congenital</p> |

<sup>1</sup> Example of measure description: Percentage of adult patients with diabetes aged 18-75 years receiving one or more A1c test(s) per year.  
NQF Measure Submission Form, V3.1

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|                                        | <p><b>cardiac disease:</b></p> <p>10, 20, 30, 40, 2110, 50, 60, 70, 80, 85, 100, 110, 120, 130, 140, 150, 170, 180, 190, 2300, 2250, 2230, 210, 220, 230, 240, 2290, 250, 2220, 260, 270, 2120, 280, 2200, 290, 300, 310, 330, 340, 350, 360, 370, 380, 390, 400, 420, 430, 440, 450, 460, 2280, 465, 470, 480, 490, 500, 510, 520, 530, 540, 550, 570, 590, 2270, 600, 630, 640, 650, 610, 620, 1774, 1772, 580, 660, 2240, 2310, 2320, 670, 680, 690, 700, 715, 720, 730, 735, 740, 750, 760, 770, 780, 2100, 790, 800, 810, 820, 830, 2260, 840, 850, 860, 870, 880, 2160, 2170, 2180, 2140, 2150, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 1000, 1010, 1025, 1030, 2340, 1035, 1050, 1060, 1070, 1080, 1090, 1110, 1120, 1123, 1125, 1130, 1140, 1145, 1150, 1160, 2190, 2210, 1180, 1200, 1210, 1220, 1230, 1240, 1250, 1260, 1275, 1280, 1285, 1290, 1291, 1300, 1310, 1320, 1330, 1340, 1360, 1365, 1370, 1380, 1390, 1410, 1450, 1460, 2350, 1470, 1480, 1490, 1500, 1590, 1600, 1610, 1630, 2095, 1640, 1650, 1660, 1670, 1680, 1690, 1700, 2330, 2130, 1720, 1730, 1740, 1760, 1780, 1790, 1802, 1804, 1830, 1860</p> <p><b>**Please find data definitions in STS Attachment 2 (of 2) - STS Procedure Code Definitions.</b></p> <p>Pediatric heart surgery is heart surgery on patients &lt;18 years of age to treat congenital or acquired cardiac disease. Congenital heart surgery is heart surgery on patients of any age to treat congenital cardiac disease.</p> <p>Our measures apply to both pediatric heart surgery and congenital heart surgery, thus applying to the following operations:</p> <ol style="list-style-type: none"> <li>1. heart surgery on patients less than 18 years of age to treat congenital or acquired cardiac disease</li> <li>2. heart surgery on patients of any age to treat congenital cardiac disease</li> </ol> <p><b>References:</b></p> <p>1. Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STs Congenital Database Committee. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.</p> |
| <p><b>6</b></p> <p>(2a)</p> <p>2d)</p> | <p><b>Denominator Exclusions:</b></p> <p><b>Measure Exclusions:</b></p> <p>Any operation that is not a pediatric or congenital Cardiac Operation. Cardiac operations are defined as operations that are of operation types of "CPB" or "No CPB Cardiovascular" (CPB is cardiopulmonary bypass.) [1].</p> <p>Any operation that is a pediatric or congenital open heart surgery (operation types of "CPB" or "No CPB Cardiovascular") that cannot be classified into a level of complexity by the five STS-EACTS Mortality Levels.</p> <p>1. Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STs Congenital Database Committee. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.</p> <p><b>Denominator Exclusion Details</b> (Definitions, codes with description):</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>7</b></p> <p>(2a)</p> <p>2h)</p> | <p><b>Stratification</b> Do the measure specifications require the results to be stratified? <b>Other</b></p> <p>► If "other" describe: <b>Stratified by the five STS-EACTS Mortality Levels, a multi-institutional validated complexity stratification tool. Please see information provided in numerator details section above</b></p> <p><b>Identification of stratification variable(s):</b></p> <p><b>Stratification Details</b> (Definitions, codes with description):</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>8</b></p> <p>(2a)</p>            | <p><b>Risk Adjustment</b> Does the measure require risk adjustment to account for differences in patient severity before the onset of care? <b>No</b> ► <b>If yes, (select one)</b></p> <p>► Is there a separate proprietary owner of the risk model? <b>(select one)</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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| 2e)  | <b>Identify Risk Adjustment Variables:</b><br><br><b>Detailed risk model:</b> attached <input type="checkbox"/> <b>OR</b> Web page URL:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| 9    | <b>Type of Score:</b> <a href="#">Rate/proportion</a> <b>Calculation Algorithm:</b> attached <input type="checkbox"/> <b>OR</b> Web page URL:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| (2a) | <b>Interpretation of Score</b> (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)<br><b>Better quality = Lower score</b> ► If "Other", please describe: <a href="#">Just monitoring this measure should improve quality.</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| 10   | <b>Identify the required data elements</b> (e.g., primary diagnosis, lab values, vital signs): <a href="#">Primary diagnosis, operation</a><br><b>Data dictionary/code table</b> attached <input type="checkbox"/> <b>OR</b> Web page URL:<br><b>Data Quality</b> (2a) Check all that apply<br><input checked="" type="checkbox"/> Data are captured from an authoritative/accurate source (e.g., lab values from laboratory personnel)<br><input checked="" type="checkbox"/> Data are coded using recognized data standards<br><input checked="" type="checkbox"/> Method of capturing data electronically fits the workflow of the authoritative source<br><input checked="" type="checkbox"/> Data are available in EHRs<br><input checked="" type="checkbox"/> Data are auditable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 11   | <b>Data Source and Data Collection Methods</b> Identifies the data source(s) necessary to implement the measure specifications. Check all that apply<br><input checked="" type="checkbox"/> Electronic Health/Medical Record<br><input checked="" type="checkbox"/> Electronic Clinical Database, Name: <a href="#">The Society of Thoracic Surgeons Congenital Heart Surgery Database</a><br><input checked="" type="checkbox"/> Electronic Clinical Registry, Name: <a href="#">The Society of Thoracic Surgeons Congenital Heart Surgery Database</a><br><input checked="" type="checkbox"/> Electronic Claims<br><input type="checkbox"/> Electronic Pharmacy data<br><input type="checkbox"/> Electronic Lab data<br><input type="checkbox"/> Electronic source - other, Describe:<br><input checked="" type="checkbox"/> Paper Medical Record<br><input type="checkbox"/> Standardized clinical instrument, Name:<br><input type="checkbox"/> Standardized patient survey, Name:<br><input type="checkbox"/> Standardized clinician survey, Name:<br><input type="checkbox"/> Other, Describe:<br>Instrument/survey attached <input type="checkbox"/> <b>OR</b> Web page URL:<br><a href="http://www.sts.org/documents/pdf/ndb/CongenitalDataCollectionForm3_0_NonAnnotated_20090916.pdf">http://www.sts.org/documents/pdf/ndb/CongenitalDataCollectionForm3_0_NonAnnotated_20090916.pdf</a> |  |
| 12   | <b>Sampling</b> If measure is based on a sample, provide instructions and guidance on sample size.<br><b>Minimum sample size:</b><br><b>Instructions:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| 13   | <b>Type of Measure:</b> <a href="#">Outcome</a> ► If "Other", please describe:<br>► If part of a composite or paired with another measure, please identify composite or paired measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 14   | <b>Unit of Measurement/Analysis</b> (Who or what is being measured) Check all that apply.<br><input type="checkbox"/> Can be measured at all levels<br><input type="checkbox"/> Individual clinician (e.g., physician, nurse)<br><input checked="" type="checkbox"/> Group of clinicians (e.g., facility department/unit, group practice)<br><input checked="" type="checkbox"/> Facility (e.g., hospital, nursing home)<br><input checked="" type="checkbox"/> Integrated delivery system<br><input checked="" type="checkbox"/> Health plan<br><input checked="" type="checkbox"/> Community/Population<br><input type="checkbox"/> Other (Please describe):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
| 15   | <b>Applicable Care Settings</b> Check all that apply<br><input type="checkbox"/> Can be used in all healthcare settings<br><input type="checkbox"/> Ambulatory Care (office/clinic)<br><input type="checkbox"/> Behavioral Healthcare<br><input type="checkbox"/> Community Healthcare<br><input type="checkbox"/> Dialysis Facility<br><input type="checkbox"/> Emergency Department<br><input type="checkbox"/> EMS emergency medical services<br><input type="checkbox"/> Hospice<br><input checked="" type="checkbox"/> Hospital<br><input type="checkbox"/> Long term acute care hospital<br><input type="checkbox"/> Nursing home/ Skilled Nursing Facility (SNF)<br><input type="checkbox"/> Prescription Drug Plan<br><input type="checkbox"/> Rehabilitation Facility<br><input type="checkbox"/> Substance Use Treatment Program/Center                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |

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|                                                                                                                                                                                     | <input type="checkbox"/> Health Plan<br><input type="checkbox"/> Home Health                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <input type="checkbox"/> Other (Please describe): |
| <b>IMPORTANCE TO MEASURE AND REPORT</b>                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                   |
| <b>Note: This is a threshold criterion. If a measure is not judged to be sufficiently important to measure and report, it will not be evaluated against the remaining criteria.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                   |
| <b>16</b><br>(1a )                                                                                                                                                                  | <b>Is measure related to a National Priority Partners priority area?</b> Safety reliability<br><b>(for NQF staff use) Does measure address a specific NPP goal?</b> ( <a href="http://www.qualityforum.org/about/NPP/">www.qualityforum.org/about/NPP/</a> ): Safety                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |
| <b>17</b><br>(1a )                                                                                                                                                                  | <b>Does the measure address a high impact aspect of healthcare</b> high resource use<br><br><b>Summary of Evidence:</b> 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.<br><br><b>Citations<sup>2</sup> for Evidence:</b> 1. Tchervenkov CI, Jacobs JP, Bernier P-L, Stellin G, Kurosawa H, Mavroudis C, Jonas RA, Cicek SM, Al-Halees Z, J. Elliott MJ, Jatene MB, Kinsley RH, Kreutzer C, Leon-Wyss J, Liu J, Maruszewski B, Nunn GR, Ramirez-Marroquin S, Sandoval N, Sano S, Sarris GE, Sharma R, Shoenb A, Spray TL, Ungerleider RM, Yangni-Angate H, Ziemer G. 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. 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, Volume 18, Issue S2 (Suppl. 2), pp 63-69, December 9, 2008. |                                                   |
| <b>18</b><br>(1b )                                                                                                                                                                  | <b>Opportunity for Improvement</b> Provide evidence that demonstrates considerable variation, or overall poor performance, across providers.<br><b>Summary of Evidence:</b> The incidence of mortality stratified by complexity varies between centers, as demonstrated in the STS Congenital Heart Surgery Database.<br><br><b>Citations for Evidence:</b><br>Jacobs JP, Jacobs ML, Mavroudis C, Lacour-Gayet FG, Tchervenkov CI. Executive Summary: The Society of Thoracic Surgeons Congenital Heart Surgery Database - Tenth Harvest - (January 1, 2005 - December 31, 2008). The Society of Thoracic Surgeons (STS) and Duke Clinical Research Institute (DCRI), Duke University Medical Center, Durham, North Carolina, United States, Spring 2009 Harvest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                   |
| <b>19</b><br>(1b )                                                                                                                                                                  | <b>Disparities</b> Provide evidence that demonstrates disparity in care/outcomes related to the measure focus among populations.<br><b>Summary of Evidence:</b> No formal testing of disparities has been done. Disparities and trends could be tested for many of these metrics using the STS Database.<br><br>The incidence of mortality stratified by complexity varies between centers, as demonstrated in the STS Congenital Heart Surgery Database.<br><br><b>Citations for evidence:</b><br>Jacobs JP, Jacobs ML, Mavroudis C, Lacour-Gayet FG, Tchervenkov CI. Executive Summary: The Society of Thoracic Surgeons Congenital Heart Surgery Database - Tenth Harvest - (January 1, 2005 - December 31, 2008). The Society of Thoracic Surgeons (STS) and Duke Clinical Research Institute (DCRI), Duke University Medical Center, Durham, North Carolina, United States, Spring 2009 Harvest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                   |
| <b>20</b><br>(1c )                                                                                                                                                                  | <b>If measuring an Outcome</b> Describe relevance to the national health goal/priority, condition, population, and/or care being addressed: Over the past decade, mortality after pediatric cardiac surgery has been declining and currently stands at 4%. This declining mortality and the limited number of pediatric cardiac surgical cases have made the assessment of mortality, as a single measure, to evaluate the quality of care less meaningful. The assessment of morbidity has become more important [1]. In addition, the incidence of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |

<sup>2</sup> Citations can include, but are not limited to journal articles, reports, web pages (URLs).  
 NQF Measure Submission Form, V3.1



|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                   |                                                        |                                        |                                                       |                                                           |                                                   |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------|----------------------------------------|-------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------|
|                                                           | <p>mortality stratified by complexity varies between centers, as demonstrated in the STS Congenital Heart Surgery Database [2].</p> <p>1. Jacobs JP, Jacobs ML, et. al. What is Operative Morbidity? Defining Complications in a Surgical Registry Database. <i>Annals of Thoracic Surgery</i> 2007;87:1416-1421.</p> <p>2. Jacobs JP, Jacobs ML, Mavroudis C, Lacour-Gayet FG, Tchervenkov CI. Executive Summary: The Society of Thoracic Surgeons Congenital Heart Surgery Database - Tenth Harvest - (January 1, 2005 - December 31, 2008). The Society of Thoracic Surgeons (STS) and Duke Clinical Research Institute (DCRI), Duke University Medical Center, Durham, North Carolina, United States, Spring 2009 Harvest.</p> <p><b>If not measuring an outcome, provide evidence supporting this measure topic and grade the strength of the evidence</b></p> <p><i>Summarize the evidence (including citations to source) supporting the focus of the measure as follows:</i></p> <ul style="list-style-type: none"> <li>• <u>Intermediate outcome</u> - evidence that the measured intermediate outcome (e.g., blood pressure, Hba1c) leads to improved health/avoidance of harm or cost/benefit.</li> <li>• <u>Process</u> - evidence that the measured clinical or administrative process leads to improved health/avoidance of harm and if the measure focus is on one step in a multi-step care process, it measures the step that has the greatest effect on improving the specified desired outcome(s).</li> <li>• <u>Structure</u> - evidence that the measured structure supports the consistent delivery of effective processes or access that lead to improved health/avoidance of harm or cost/benefit.</li> <li>• <u>Patient experience</u> - evidence that an association exists between the measure of patient experience of health care and the outcomes, values and preferences of individuals/ the public.</li> <li>• <u>Access</u> - evidence that an association exists between access to a health service and the outcomes of, or experience with, care.</li> <li>• <u>Efficiency</u>- demonstration of an association between the measured resource use and level of performance with respect to one or more of the other five IOM aims of quality.</li> </ul> <p><b>Type of Evidence</b> Check all that apply</p> <table border="0"> <tr> <td><input type="checkbox"/> Evidence-based guideline</td> <td><input type="checkbox"/> Quantitative research studies</td> </tr> <tr> <td><input type="checkbox"/> Meta-analysis</td> <td><input type="checkbox"/> Qualitative research studies</td> </tr> <tr> <td><input type="checkbox"/> Systematic synthesis of research</td> <td><input type="checkbox"/> Other (Please describe):</td> </tr> </table> <p><b>Overall Grade for Strength of the Evidence</b><sup>3</sup> (Use the USPSTF system, or if different, also describe how it relates to the USPSTF system):</p> <p><b>Summary of Evidence</b> (provide guideline information below):</p> <p><b>Citations for Evidence:</b></p> | <input type="checkbox"/> Evidence-based guideline | <input type="checkbox"/> Quantitative research studies | <input type="checkbox"/> Meta-analysis | <input type="checkbox"/> Qualitative research studies | <input type="checkbox"/> Systematic synthesis of research | <input type="checkbox"/> Other (Please describe): |
| <input type="checkbox"/> Evidence-based guideline         | <input type="checkbox"/> Quantitative research studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                   |                                                        |                                        |                                                       |                                                           |                                                   |
| <input type="checkbox"/> Meta-analysis                    | <input type="checkbox"/> Qualitative research studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                   |                                                        |                                        |                                                       |                                                           |                                                   |
| <input type="checkbox"/> Systematic synthesis of research | <input type="checkbox"/> Other (Please describe):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                   |                                                        |                                        |                                                       |                                                           |                                                   |
| 21<br>(1c)                                                | <p><b>Clinical Practice Guideline</b> Cite the guideline reference; quote the specific guideline recommendation related to the measure and the guideline author's assessment of the strength of the evidence; and summarize the rationale for using this guideline over others.</p> <p><b>Guideline Citation:</b> At the current time no uniform practice guidelines are in place for pediatric and congenital cardiac surgery. Clinical care rationale mainly depends on the consensus of a panel of experts in the field. In lieu of guideline support for the measures, published consensus opinion and supporting clinical data from the STS Congenital Heart Surgery Database will be used.</p> <p><b>Specific guideline recommendation:</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                   |                                                        |                                        |                                                       |                                                           |                                                   |

<sup>3</sup>The strength of the body of evidence for the specific measure focus should be systematically assessed and rated, e.g., USPSTF grading system [www.ahrq.gov/clinic/uspstmeth.htm](http://www.ahrq.gov/clinic/uspstmeth.htm): A - The USPSTF recommends the service. There is high certainty that the net benefit is substantial. B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial. C - The USPSTF recommends against routinely providing the service. There may be considerations that support providing the service in an individual patient. There is at least moderate certainty that the net benefit is small. Offer or provide this service only if other considerations support the offering or providing the service in an individual patient. D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits. I - The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.



**Guideline author's rating of strength of evidence** (If different from USPSTF, also describe it and how it relates to USPSTF):

**Rationale for using this guideline over others:**

**22 Controversy/Contradictory Evidence** Summarize any areas of controversy, contradictory evidence, or contradictory guidelines and provide citations.

(1c) **Summary:**

The selection of the proper tool for complexity stratification tool can be controversial. Suitable multi-institutional validated complexity stratification tools include the 5 functional RACHS-1 classifications, the 4 Aristotle Basic Complexity Score Levels, and the five STS-EACTS Mortality Levels [1, 2, 3, 4, 5]. When comparing RACHS-1 and Aristotle, the Aristotle methodology allows classification of more operations while the RACHS-1 system discriminates better at the higher end of complexity [5].

The discrimination of any complexity stratification tool as a predictor of mortality can be quantified by calculating the c statistic, which is equivalent to the area under the receiver operating characteristic curve, as determined by univariable logistic regression [5]. The c statistic represents the probability that a randomly selected patient who had the outcome of interest (i.e. discharge mortality) had a higher predicted risk of the outcome compared to a randomly selected patient who did not experience the outcome. The c statistic generally ranges from 0.5 to 1.0 with 0.5 representing no discrimination (i.e. a coin flip) and 1.0 representing perfect discrimination.

Table 1 displays c-statistics for the previously mentioned complexity stratification tools [4].

| Table 1: Method of Modeling Procedures                         | Model without patient covariates | Model with patient covariates |
|----------------------------------------------------------------|----------------------------------|-------------------------------|
| STS-EACTS Congenital Heart Surgery Mortality Categories (2009) | C = 0.778                        | C = 0.812                     |
| RACHS-1 Categories                                             | C = 0.745                        | C = 0.802                     |
| Aristotle Basic Complexity Score                               | C = 0.687                        | C = 0.795                     |

**\*\*STS recommends that only the STS-EACTS Congenital Heart Surgery Mortality Categories (2009) are used for complexity stratification of mortality. The rationale for this is two-fold:**

- 1. The C-statistic for the STS-EACTS Congenital Heart Surgery Mortality Categories (2009) is higher than those of the RACHS-1 Categories and the Aristotle Basic Complexity Score.**
- 2. The publications provided below document that 84% of pediatric and congenital cardiac operations can be assessed by the RACHS-1 Categories, 96% by the Aristotle Basic Complexity Score, and 99% by the STS-EACTS Congenital Heart Surgery Mortality Categories (2009) [3,4,5].**

**Please note that the following publication is provided as STS Attachment 1 (of 2) - O'Brien et al, JTCVS, Nov 2009:**

O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. **An empirically based tool for analyzing mortality associated with congenital heart surgery.** The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.

**Citations:**

- 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. In: 2008 Cardiology in the Young Supplement: 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, Volume 18, Issue S2 (Suppl. 2), pp 163-168, December 9, 2008.

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | <p>2. Clarke DR, Lacour-Gayet F, Jacobs JP, Jacobs ML, Maruszewski B, Pizarro C, Edwards FH, Mavroudis C. The assessment of complexity in congenital cardiac surgery based on objective data. In: 2008 Cardiology in the Young Supplement: 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, Volume 18, Issue S2 (Suppl. 2), pp 169-176, December 9, 2008.</p> <p>3. O'Brien SM, Jacobs JP, Clarke DR, Maruszewski B, Jacobs ML, Walters HL 3rd, Tchervenkov CI, Welke KF, Tobota Z, Stellin G, Mavroudis C, Hamilton JR, Gaynor JW, Pozzi M, Lacour-Gayet FG. Accuracy of the Aristotle Basic Complexity Score for classifying the mortality and morbidity potential of congenital heart surgery operations. The Annals of Thoracic Surgery, 84(6):2027-37, PMID: 18036930, December 2007.</p> <p>4. O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. An empirically based tool for analyzing mortality associated with congenital heart surgery. The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.</p> <p>5. Jacobs JP, Jacobs ML, Lacour-Gayet FG, Jenkins KJ, Gauvreau K, Bacha EA, Maruszewski B, Clarke DR, Tchervenkov CI, Gaynor JW, Spray, TL, Stellin G, O'Brien SM, Elliott MJ, Mavroudis C. 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. Pediatric Cardiology, accepted for publication, in press.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>23</b><br/>(1)</p> | <p><b>Briefly describe how this measure (as specified) will facilitate significant gains in healthcare quality related to the specific priority goals and quality problems identified above:</b> Over the past decade, mortality after pediatric cardiac surgery has been declining and currently stands at 4%. Nevertheless, operative mortality remains a significant indicator of programmatic quality. Because case mix varies between programs, operative mortality must be stratified by case mix [1, 2, 3, 4, 5].</p> <p>1. 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. In: 2008 Cardiology in the Young Supplement: 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, Volume 18, Issue S2 (Suppl. 2), pp 163-168, December 9, 2008.</p> <p>2. Clarke DR, Lacour-Gayet F, Jacobs JP, Jacobs ML, Maruszewski B, Pizarro C, Edwards FH, Mavroudis C. The assessment of complexity in congenital cardiac surgery based on objective data. In: 2008 Cardiology in the Young Supplement: 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, Volume 18, Issue S2 (Suppl. 2), pp 169-176, December 9, 2008.</p> <p>3. O'Brien SM, Jacobs JP, Clarke DR, Maruszewski B, Jacobs ML, Walters HL 3rd, Tchervenkov CI, Welke KF, Tobota Z, Stellin G, Mavroudis C, Hamilton JR, Gaynor JW, Pozzi M, Lacour-Gayet FG. Accuracy of the Aristotle Basic Complexity Score for classifying the mortality and morbidity potential of congenital heart surgery operations. The Annals of Thoracic Surgery, 84(6):2027-37, PMID: 18036930, December 2007.</p> <p>4. O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. An empirically based tool for analyzing mortality associated with congenital heart surgery. The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.</p> <p>5. Jacobs JP, Jacobs ML, Lacour-Gayet FG, Jenkins KJ, Gauvreau K, Bacha EA, Maruszewski B, Clarke DR, Tchervenkov CI, Gaynor JW, Spray, TL, Stellin G, O'Brien SM, Elliott MJ, Mavroudis C. 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</p> |

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|           | Database. Pediatric Cardiology, accepted for publication, in press.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|           | <b>SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|           | <b>Note: Testing and results should be summarized in this form. However, additional detail and reports may be submitted as supplemental information or provided as a web page URL. If a measure has not been tested, it is only potentially eligible for time-limited endorsement.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>24</b> | <b>Supplemental Testing Information:</b> attached <input type="checkbox"/> OR Web page URL: <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>25</b> | <b>Reliability Testing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (2b)      | <p><b>Data/sample:</b></p> <p>"Reliability is the extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials. Without the agreement of independent observers able to replicate research procedures, or the ability to use research tools and procedures that yield consistent measurements, researchers would be unable to satisfactorily draw conclusions, formulate theories, or make claims about the generalizability of their research."</p> <p>[<a href="http://writing.colostate.edu/guides/research/relval/">http://writing.colostate.edu/guides/research/relval/</a>]</p> <p>The reliability of the STS-EACTS Congenital Heart Surgery Mortality Categories (2009) is documented in detail in the following manuscript:</p> <p>O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. An empirically based tool for analyzing mortality associated with congenital heart surgery. The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.</p> <p><b><u>Accuracy and Completeness of the STS Congenital Heart Surgery Database data</u></b></p> <p>The audit process assures the accuracy and completeness of the STS Congenital data through a combination of two strategies:</p> <ol style="list-style-type: none"> <li>1. Intrinsic data verification – designed to rectify inconsistencies of data and missing elements of data)</li> <li>2. Site visits with "Source Data Verification" – in other words, verification of the data at the primary source of the data</li> </ol> <p>This process of verification of data has demonstrated that the STS Congenital Heart Surgery Database is very complete and accurate, as documented in the STS Congenital Heart Surgery Database Report Overview, as well as in the following peer-reviewed publication:</p> <p>Clarke DR, Breen LS, Jacobs ML, Franklin RCG, Tobota Z, Maruszewski B, Jacobs JP. <b>Verification of data in congenital cardiac surgery.</b> In: 2008 Cardiology in the Young Supplement: 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, Volume 18, Issue S2 (Suppl. 2), pp 177-187, December 9, 2008.</p> <p><b>Analytic Method:</b></p> <p><b>Testing Results:</b></p> |
| <b>26</b> | <b>Validity Testing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (2c)      | <p><b>Data/sample:</b></p> <p>"Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the actual measuring instrument or procedure, validity is concerned with the study's success at measuring what the researchers set out to measure."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Researchers should be concerned with both external and internal validity. External validity refers to the extent to which the results of a study are generalizable or transferable.

Internal validity refers to (1) the rigor with which the study was conducted (e.g., the study's design, the care taken to conduct measurements, and decisions concerning what was and wasn't measured) and (2) the extent to which the designers of a study have taken into account alternative explanations for any causal relationships they explore (Huitt, 1998). In studies that do not explore causal relationships, only the first of these definitions should be considered when assessing internal validity.

Scholars discuss several types of internal validity:

- Face Validity
- Criterion Related Validity
- Construct Validity
- Content Validity"

[<http://writing.colostate.edu/guides/research/relval/>]

This measure has been developed by a multi-institutional, multi-subspecialty panels of experts made up of international leaders in the medical and surgical care of patients with pediatric and congenital heart disease. This process is described in detail in the following publications:

1. Jacobs JP. (Editor). 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, Cardiology in the Young, Volume 18, Supplement S2, pages 1 -530, December 9, 2008.
2. Jacobs JP. **Introduction - Databases and the assessment of complications associated with the treatment of patients with congenital cardiac disease**. 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, Volume 18, Issue S2 (Suppl. 2), pp 1-37, December 9, 2008.
3. Jacobs JP, Jacobs ML, Mavroudis C, Backer CL, Lacour-Gayet FG, Tchervenkov CI, Franklin RCG, Béland MJ, Jenkins KJ, Walters III H, Bacha EA, Maruszewski B, Kurosawa H, Clarke DR, Gaynor JW, Spray TL, Stellin G, Ebels T, Krogmann ON, Aiello VD, Colan SD, Weinberg P, Giroud JM, Everett A, Wernovsky G, Martin J, Elliott MJ, Edwards FH. **Nomenclature and databases for the surgical treatment of congenital cardiac disease - an updated primer and an analysis of opportunities for improvement**. 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, Volume 18, Issue S2 (Suppl. 2), pp 38-62, December 9, 2008.

Mortality and morbidity related to pediatric and congenital heart surgery are defined in detail in the following publications:

1. Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. **What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STS Congenital Database Committee**. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.
2. Jacobs JP, Jacobs ML, Mavroudis C, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ, Vener DF, Barach P, Benavidez OJ, Bacha EA.. **What is Operative Morbidity? Defining Complications in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STS Congenital Database Committee**. The Annals of Thoracic Surgery; 84:1416-1421, October 2007.

Due to the process used to develop these measures, we believe they have exceptional face validity. These metrics have external validity because they are clearly generalizable or transferable, as documented in the publications mentioned above. When used in the STS Congenital Heart Surgery Database, these metrics have internal validity due to (1) the rigor of the analyses conducted and (2) the extent to which the STS Congenital Heart Surgery Database Task Force has recognized and considered alternative explanations for any causal relationships reported, as documented in the STS Congenital Heart Surgery Database Feedback Report and Report Overview, which has been sent to the National Quality Forum in a separate e-mail. Finally, as these outcome metrics encompass a broad and comprehensive range of outcomes that are all directly related to pediatric cardiac surgery performance, we believe they have strong content and construct validity.

As stated above, extensive testing has also been performed within the STS Congenital Heart Surgery Database that confirms the validity and reliability of the three multi-institutional validated complexity stratification tools (the five functional RACHS-1 classifications, the four Aristotle Basic Complexity Score Levels, or the five STS-EACTS Congenital Heart Surgery Mortality Categories [2009]). This testing is summarized in the following manuscripts:

1. O'Brien SM, Jacobs JP, Clarke DR, Maruszewski B, Jacobs ML, Walters HL 3rd, Tchervenkov CI, Welke KF, Tobota Z, Stellin G, Mavroudis C, Hamilton JR, Gaynor JW, Pozzi M, Lacour-Gayet FG. **Accuracy of the Aristotle Basic Complexity Score for classifying the mortality and morbidity potential of congenital heart surgery operations.** The Annals of Thoracic Surgery, 84(6):2027-37, PMID: 18036930, December 2007.
2. Jacobs JP, Jacobs ML, Lacour-Gayet FG, Jenkins KJ, Gauvreau K, Bacha E, Maruszewski B, Clarke DR, Tchervenkov CI, Gaynor JW, Spray TL, Stellin G, O'Brien SM, Elliott MJ, Mavroudis C. **Stratification of complexity improves the utility and accuracy of outcomes analysis in a Multi-Institutional Congenital Heart Surgery Database: Application of the Risk Adjustment in Congenital Heart Surgery (RACHS-1) and Aristotle Systems in the Society of Thoracic Surgeons (STS) Congenital Heart Surgery Database.** Pediatric Cardiology, 2009, DOI 10.1007/s00246-009-9496-0.
3. O'Brien SM, Clarke DR, Jacobs JP, Jacobs ML, Lacour-Gayet FG, Pizarro C, Welke KF, Maruszewski B, Tobota Z, Miller WJ, Hamilton L, Peterson ED, Mavroudis C, Edwards FH. **An empirically based tool for analyzing mortality associated with congenital heart surgery.** The Journal of Thoracic and Cardiovascular Surgery, 2009 Nov;138(5):1139-53.PMID: 19837218, November 2009.

The third manuscript in the list above describes the development of the "STS-EACTS Congenital Heart Surgery Mortality Categories (2009)" using data from 77,294 operations entered into the European Association for Cardiothoracic Surgery (EACTS) Congenital Heart Surgery Database (33,360 operations) and the STS Congenital Heart Surgery Database (43,934 patients) between 2002 and 2007. This manuscript clearly states that: "Model performance was subsequently assessed in an independent validation sample (n = 27,700) and compared with 2 existing methods: Risk Adjustment for Congenital Heart Surgery (RACHS-1) categories and Aristotle Basis Complexity scores." **This peer-reviewed and published validity testing using "an independent validation sample (n = 27,700 operations)" generated the c-statistics shown in Table 1 below and should satisfy the requirements for validity and reliability testing for our outcome metrics. The technical details of this validity and reliability testing is described in reference number 3 above. This publication is also provided as STS Attachment 1 (of 2) - O'Brien et al, JTCVS, Nov 2009.**

| Table 1: Method of Modeling Procedures                         | Model without patient covariates | Model with patient covariates |
|----------------------------------------------------------------|----------------------------------|-------------------------------|
| STS-EACTS Congenital Heart Surgery Mortality Categories (2009) | C = 0.778                        | C = 0.812                     |
| RACHS-1 Categories                                             | C = 0.745                        | C = 0.802                     |
| Aristotle Basic Complexity Score                               | C = 0.687                        | C = 0.795                     |

**Analytic Method:**



|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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|            | <b>Testing Results:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 27<br>(2d) | <p><b>Measure Exclusions</b> <i>Provide evidence to justify exclusion(s) and analysis of impact on measure results during testing.</i></p> <p><b>Summary of Evidence supporting exclusion(s):</b> We will exclude any operation that is not a pediatric or congenital Cardiac Operation. Cardiac operations are defined as operations that are of operation types of "CPB" or "No CPB Cardiovascular" (CPB is cardiopulmonary bypass.) [1].</p> <p>We will exclude any operation that is a pediatric or congenital open heart surgery (operation types of "CPB" or "No CPB Cardiovascular") that cannot be classified into a level of complexity by the five STS-EACTS Mortality Levels.</p> <p>This measure is designed to track operative mortality stratified by the five STS-EACTS Mortality Levels, which is a multi-institutional validated complexity stratification tool. Published methodology is available that describes the proper techniques for gathering this information based on the consensus of a panel of experts.</p> <p><b>**STS recommends that only the STS-EACTS Congenital Heart Surgery Mortality Categories (2009) are used for complexity stratification of mortality. The rationale for this was provided in a previous section.</b></p> <p>Furthermore, it is important to understand that the Society of Thoracic Surgeons advocates utilization of a systematic multi-institutional clinical database (registry) for the analysis of cardiac surgical outcomes and the assessment of quality. Evidence from three recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via the International Classification of Diseases as used in Administrative Databases is likely to be poor[2, 3, 4]. First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators report that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the International Classification of Diseases in the hospital discharge database [2]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using the International Classification of Diseases. A review of these 66 medical records by physicians was able to confirm only 41% of the codes contained in the administrative database from the International Classification of Diseases [3]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the federal government of the United States of America carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [4]. 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 the International Classification of Diseases are likely to "have substantial misclassification" of congenital cardiac disease.</p> <p>Several potential reasons can explain the poor diagnostic accuracy of Administrative Databases and codes from the International Classification of Diseases:</p> <ol style="list-style-type: none"> <li>1) accidental miscoding</li> <li>2) coding performed by medical records clerks who have never seen the actual patient</li> <li>3) contradictory or poorly described information in the medical record</li> <li>4) lack of diagnostic specificity for congenital cardiac disease in the codes of the of International Classification of Diseases</li> <li>5) inadequately trained medical coders</li> </ol> <p><b>Citations for Evidence:</b></p> <ol style="list-style-type: none"> <li>1. Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STC Congenital Database Committee. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.</li> <li>2. 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.</li> </ol> |

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <p>3. 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: 737-742.</p> <p>4. 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, Volume 18, Issue S2 (Suppl. 2), pp 92-100, December 9, 2008.</p> <p><b>Data/sample:</b></p> <p><b>Analytic Method:</b></p> <p><b>Testing Results:</b></p> |
| 28<br>(2e)       | <p><b>Risk Adjustment Testing</b> Summarize the testing used to determine the need (or no need) for risk adjustment and the statistical performance of the risk adjustment method.</p> <p><b>Data/sample:</b> None</p> <p><b>Analytic Method:</b></p> <p><b>Testing Results:</b></p> <p>► If outcome or resource use measure not risk adjusted, provide rationale:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 29<br>(2g)       | <p><b>Testing comparability of results when more than 1 data method is specified</b> (e.g., administrative claims or chart abstraction)</p> <p><b>Data/sample:</b> Clinical data abstraction is the only method utilized</p> <p><b>Analytic Method:</b></p> <p><b>Results:</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 30<br>(2f)       | <p><b>Provide Measure Results from Testing or Current Use</b> (select one)</p> <p><b>Data/sample:</b> The STS Congenital Heart Surgery Database</p> <p><b>Methods to identify statistically significant and practically/meaningfully differences in performance:</b><br/>Outliers can be identified with 95% confidence intervals based on the sample size, with complexity stratification for one and four-year time intervals.</p> <p><b>Results:</b> Currently being collected in the STS Congenital Heart Surgery Database. We know that 82 out of 122 pediatric heart surgery centers in the USA participate in the STS Congenital Heart Surgery Database.</p>                                                                                                                                                                                                                                                                                                      |
| 31<br>(2h)       | <p><b>Identification of Disparities</b></p> <p>► If measure is stratified by factors related to disparities (i.e. race/ethnicity, primary language, gender, SES, health literacy), <b>provide stratified results:</b> NA</p> <p>► If disparities have been reported/identified, but measure is not specified to detect disparities, provide rationale:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>USABILITY</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 32<br>(3)        | <p><b>Current Use</b> In use If in use, how widely used <i>Nationally</i> ► If "other," please describe: The STS Congenital Heart Surgery Database</p> <p><input type="checkbox"/> Used in a public reporting initiative, name of initiative:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | Sample report attached <input type="checkbox"/> OR Web page URL:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>33</b><br>(3a)<br>)     | <p><b>Testing of Interpretability</b> (Testing that demonstrates the results are understood by the potential users for public reporting and quality improvement)</p> <p><b>Data/sample:</b> Post-operative mortality and morbidity data are currently being collected voluntarily by the STS Congenital Heart Surgery Database. This is the only STS outcome measure that is being submitted to NQF for review.</p> <p>One should be cautious in drawing conclusions from the observation of these outcome measures, especially in circumstances where there is a declining mortality and small volume of cases [1,2]. This situation holds true in pediatric cardiac surgery especially when compared to the adult population. "Chance" and "Bias" (information and sampling bias) can result in an inaccurate interpretation of such outcome measures [3]. This difficulty is magnified more so when evaluating small volume programs in pediatric cardiac surgery [4,5]. As such, evaluation of this data should be done over longer term intervals - not necessarily annually or over four years.</p> <p>This measure is used by clinicians as performance feedback and is tracked in the STS Database. No focused consumer testing has been done to date. Pediatric and congenital heart surgery is very different from adult heart surgery. Thus, separate metrics are necessary.</p> <p>1. Welke KF, Karamlou T, Ungerleider RM, Diggs BS. Mortality is not a valid indicator of quality differences between pediatric cardiac surgery programs. Ann Thoracic Surgery. (in press)</p> <p>2. O'Brien SM, Gauvreau K. Statistical issues in the analysis and interpretation of outcomes for congenital cardiac surgery. In: 2008 Cardiology in the Young Supplement: 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;18(Suppl.2):145-151.</p> <p>3. Welke KF, Diggs BS, Karamlou T. Databases for assessing the outcomes of the treatment of patients with congenital cardiac disease - a comparison of administrative and clinical data. Cardiology in the Young. 2008(Suppl.2):137-144.</p> <p>4. Welke KF, Diggs BS, Karamlou T, Ungerleider RM. The relationship between hospital surgical case volumes and mortality rates in pediatric cardiac surgery: a national sample 1988-2005. Ann Thoracic Surgery.2008;86:889-896.</p> <p>5. Welke KF, O'Brien SM, Peterson ED, Ungerleider RM, Jacobs ML, Jacobs JP. The complex relationship between pediatric cardiac surgical case volumes and mortality rates in a national clinical database. J Thoracic Cardiovascular Surgery.2009;137:1133-1140.</p> <p><b>Methods:</b></p> <p><b>Results:</b></p> |
| <b>34</b><br>(3b)<br>, 3c) | <p><b>Relation to other NQF-endorsed™ measures</b></p> <p>► Is this measure similar or related to measure(s) already endorsed by NQF (on the same topic or the same target population)? Measures can be found at <a href="http://www.qualityforum.org">www.qualityforum.org</a> under Core Documents. Check all that apply</p> <p><input type="checkbox"/> Have not looked at other NQF measures <input checked="" type="checkbox"/> Other measure(s) on same topic</p> <p><input checked="" type="checkbox"/> Other measure(s) for same target population <input type="checkbox"/> No similar or related measures</p> <p><b>Name and number of similar or related NQF-endorsed™ measure(s):</b></p> <p>NQF # 0340</p> <p>Title: Pediatric Heart Surgery Volume (PDI 7)</p> <p>Status: Endorsed</p> <p>Endorsed on: MAY 15, 2008</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Steward(s): Agency for Healthcare Research and Quality  
Description: Raw volume compared to annual thresholds (100 procedures)

NQF # 0339

Title: Pediatric Heart Surgery Mortality (PDI 6) (risk adjusted)

Status: Endorsed

Endorsed on: MAY 15, 2008

Steward(s): Agency for Healthcare Research and Quality

Description: Number of in-hospital deaths in patients undergoing surgery for congenital heart disease per 1000 patients.

**Are the measure specifications harmonized with existing NQF-endorsed™ measures? Not harmonized**

► If not fully harmonized, provide rationale:

NQF # 0340 and NQF # 0339 are both suboptimal. The limitations of each of these measures will be reviewed below:

NQF # 0340

Title: Pediatric Heart Surgery Volume (PDI 7)

Status: Endorsed

Endorsed on: MAY 15, 2008

Steward(s): Agency for Healthcare Research and Quality

Description: Raw volume compared to annual thresholds (100 procedures)

The relationship between the volume of pediatric and congenital cardiac surgery performed at a center and quality of care is unclear and controversial at best [1, 2, 3, 4, 5, 6, 7]. Evidence simply does not exist to support an annual volume threshold of 100 procedures.

Nevertheless, in order to track a variety of outcomes represented in other proposed Quality Indicators, one must have a firm grasp on the volume of pediatric and congenital cardiac surgery performed at a center over both 1 year and 4 year time intervals. The very act of tracking this structure measure is necessary in order to track other outcome measures that use this structure measure as a denominator. Furthermore, very act of tracking this structure measure should in and of itself lead to improvements in quality.

The operations counted towards this metric must clearly be defined as pediatric or congenital Cardiac Operation. Cardiac operations are defined as operations that are of operation types of "CPB" or "No CPB Cardiovascular" (CPB is cardiopulmonary bypass.) [8]. Published methodology is available that describes the proper techniques for gathering this information based on the consensus of a panel of experts.

NQF # 0339

Title: Pediatric Heart Surgery Mortality (PDI 6) (risk adjusted)

Status: Endorsed

Endorsed on: MAY 15, 2008

Steward(s): Agency for Healthcare Research and Quality

Description: Number of in-hospital deaths in patients undergoing surgery for congenital heart disease per 1000 patients.

Furthermore, it is important to understand that the Society of Thoracic Surgeons advocates utilization of a systematic multi-institutional clinical database (registry) for the analysis of cardiac surgical outcomes and the assessment of quality. Evidence from three recent investigations suggests that the validity of coding of lesions seen in the congenitally malformed heart via the International Classification of Diseases as used in Administrative Databases is likely to be poor[9, 10, 11]. First, in a series of 373 infants with congenital cardiac defects at Children's Hospital of Wisconsin, investigators report that only 52% of the cardiac diagnoses in the medical records had a corresponding code from the International Classification of Diseases in the hospital discharge database [9]. Second, the Hennepin County Medical Center discharge database in Minnesota identified all infants born during 2001 with a code for congenital cardiac disease using the International Classification of Diseases. A review of these 66 medical records by physicians was able to

confirm only 41% of the codes contained in the administrative database from the International Classification of Diseases [10]. Third, the Metropolitan Atlanta Congenital Defect Program of the Birth Defect Branch of the Centers for Disease Control and Prevention of the federal government of the United States of America carried out surveillance of infants and fetuses with cardiac defects delivered to mothers residing in Atlanta during the years 1988 through 2003 [11]. 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 the International Classification of Diseases are likely to “have substantial misclassification” of congenital cardiac disease.

Several potential reasons can explain the poor diagnostic accuracy of Administrative Databases and codes from the International Classification of Diseases:

- 1) accidental miscoding
- 2) coding performed by medical records clerks who have never seen the actual patient
- 3) contradictory or poorly described information in the medical record
- 4) lack of diagnostic specificity for congenital cardiac disease in the codes of the of International Classification of Diseases
- 5) inadequately trained medical coders

#### References:

1. Welke KF, O'Brien SM, Peterson ED, Ungerleider RM, Jacobs ML, Jacobs JP. The Complex Relationship between Pediatric Cardiac Surgical Case Volumes and Mortality Rates in a National Clinical Database. The Journal of Thoracic and Cardiovascular Surgery,. 2009 May;137(5):1133-40. Epub 2009 Mar 17, PMID: 19379979, May, 2009.
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6. Chang RK, Klitzner TS. Can regionalization decrease the number of deaths for children who undergo cardiac surgery? A theoretical analysis. Pediatrics. 2002; 109:173-81.
7. Quintessenza JA, Jacobs JP, Morell VO. Issues in Regionalization of Pediatric Cardiovascular Care. Progress in Pediatric Cardiology 18 (2003) 49-53. Elsevier Science Ireland Ltd. 2003.
8. Jacobs JP, Mavroudis C, Jacobs ML, Maruszewski B, Tchervenkov CI, Lacour-Gayet FG, Clarke DR, Yeh T, Walters HL 3rd, Kurosawa H, Stellin G, Ebels T, Elliott MJ. What is Operative Mortality? Defining Death in a Surgical Registry Database: A Report from the STS Congenital Database Task Force and the Joint EACTS-STSCongenital Database Committee. The Annals of Thoracic Surgery, 81(5):1937-41, May 2006.
9. 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.
10. 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: 737-742.

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|            | <p>11. 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, Volume 18, Issue S2 (Suppl. 2), pp 92-100, December 9, 2008.</p> <p><b>Describe the distinctive, improved, or additive value this measure provides to existing NQF-endorsed measures:</b> This metric is one of 12 structure, process, and outcome measures in pediatric and congenital cardiac surgery for evaluating quality of care. Although, in the past, there has been lack of uniform definitions as well as accurate reporting of this complication, the newly adopted consensus definitions, should continue to improve our understanding of this important measure as it relates to pediatric and congenital cardiac surgery. The importance of this metric is well documented above, and will be complementary to the remaining measures that are being evaluated by NQF.</p>                                                                                                                                                                                                 |
|            | <b>FEASIBILITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 35<br>(4a) | <p><i>How are the required data elements generated? Check all that apply</i></p> <p><input checked="" type="checkbox"/> Data elements are generated concurrent with and as a byproduct of care processes during care delivery (e.g., blood pressure or other assessment recorded by personnel conducting the assessment)</p> <p><input type="checkbox"/> Data elements are generated from a patient survey (e.g., CAHPS)</p> <p><input checked="" type="checkbox"/> Data elements are generated through coding performed by someone other than the person who obtained the original information (e.g., DRG or ICD-9 coding on claims)</p> <p><input checked="" type="checkbox"/> Other, Please describe: <i>The Society of Thoracic Surgeons Congenital Heart Surgery Database</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 36<br>(4b) | <p><i>Electronic Sources All data elements</i></p> <p>► If all data elements are not in electronic sources, specify the near-term path to electronic collection by most providers:</p> <p>► Specify the data elements for the electronic health record: <i>Diagnosis</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 37<br>(4c) | <p><i>Do the specified exclusions require additional data sources beyond what is required for the other specifications? No</i></p> <p>► If yes, provide justification:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 38<br>(4d) | <p><i>Identify susceptibility to inaccuracies, errors, or unintended consequences of the measure:</i></p> <p><u><i>Inaccuracies and Errors:</i></u><br/> <i>This measure may be susceptible to human error (i.e., recording the measure inaccurately or not recording the measure at all)</i></p> <p><u><i>Unintended Consequences:</i></u><br/> <i>One should be cautious in drawing conclusions from the observation of these outcome measures, especially in circumstances where there is a declining mortality and small volume of cases [1,2].</i></p> <p>1. Welke KF, Karamlou T, Ungerleider RM, Diggs BS. Mortality is not a valid indicator of quality differences between pediatric cardiac surgery programs. <i>Ann Thoracic Surgery.</i> (in press)</p> <p>2. O'Brien SM, Gauvreau K. Statistical issues in the analysis and interpretation of outcomes for congenital cardiac surgery. In: 2008 Cardiology in the Young Supplement: 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;18(Suppl.2):145-151.</p> <p><i>Describe how could these potential problems be audited:</i></p> <p><u><i>Inaccuracies and Errors:</i></u><br/> <i>Each participant is responsible for the quality and accuracy of the data they submit to the database. Each participant agrees to the following quality control measures in the participation agreement:</i></p> |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | <p>i) "Participant hereby warrants that all data submitted for inclusion in the CHS Database will be accurate and complete, and acknowledges that such data may be subject to independent audit. Participant will use its best efforts to address any data or related deficiencies identified by the independent data warehouse service provider, and agrees to cooperate with and assist STS and its designees in connection with the performance of any independent audit.</p> <p>ii) Participant warrants that it will take all reasonable steps to avoid the submission of duplicative data for inclusion in the CHS Database, including but not limited to apprising the Director of the STS National Database and the independent data warehouse service provider about any other Participation Agreements in which an individual cardiothoracic surgeon named above or on Schedule A attached hereto (as amended from time to time) is also named."</p> <p>In addition, the Data warehouse and analysis center at Duke Clinical Research Institute, performs a series of internal quality controls on the submitted data and issues an annual data quality report</p> <p><u>Unintended Consequences:</u><br/>The Society of Thoracic Surgeons Database audit process is used. In addition, outliers can be identified with 95% confidence intervals based on the sample size with complexity stratification for one and four-year time intervals</p> <p>Did you audit for these potential problems during testing? Yes If yes, provide results:<br/>Clarke DR, Breen LS, Jacobs ML, Franklin RCG, Tobota Z, Maruszewski B, Jacobs JP. Verification of data in congenital cardiac surgery. In: 2008 Cardiology in the Young Supplement: 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;18(Suppl. 2):177-187.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>39</b></p> <p>(4e )</p> | <p><b>Testing feasibility</b> Describe what have you learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data/missing data, timing/frequency of data collection, patient confidentiality, time/cost of data collection, other feasibility/ implementation issues:</p> <p><b>Lessons Learned:</b></p> <ul style="list-style-type: none"> <li>•The STS CHS database collects gender, race/ethnicity, age and geographic location information, so disparities and trends can be studied for populations at risk.</li> <li>•Data elements required for the measure can be captured and the measure is actionable by the physician.</li> <li>•There are no data availability issues.</li> <li>•Cost to collect the data includes staff training and the use of specific software. However there are no additional costs over what a provider would pay to be a part of the STS CHS Database or other registry that collects this information.</li> <li>•This measure can be used in a variety of care settings and at different levels of analysis (i.e. physician, hospital, etc.)</li> <li>•Formal reliability testing was not done. Instead, the participant is bound by the participation agreement and his/her participation can be monitored by observing the data submitted on an annual basis.</li> <li>•There are no confidentiality concerns. The data is de-identified, and the sites must be HIPAA compliant and obtain IRB approval for use of the database.</li> <li>•The STS Congenital Quality Measures Sub-Committee meets at the STS Annual Meeting. The Subcommittee will review each STS congenital cardiac surgery measure on a yearly basis. Changes or updates to the measure will be at the recommendation of the committee.</li> <li>• The STS has a yearly meeting (The Advances in Quality and Outcomes Conference) devoted to the Database for the clinicians and data coordinators.</li> <li>•The audit process has demonstrated that data is very complete and accurate [1].</li> </ul> <p>1. Clarke DR, Breen LS, Jacobs ML, Franklin RCG, Tobota Z, Maruszewski B, Jacobs JP. Verification of data in congenital cardiac surgery. In: 2008 Cardiology in the Young Supplement: 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;18(Suppl. 2):177-187.</p> |

| CONTACT INFORMATION        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
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| 40                         | <p><i>Web Page URL for Measure Information</i> Describe where users (implementers) should go for more details on specifications of measures, or assistance in implementing the measure.</p> <p>Web page URL: <a href="http://www.sts.org">www.sts.org</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| 41                         | <p><b>Measure Steward Point of Contact</b></p> <p><b>First Name:</b> Jane <b>MI:</b> M <b>Last Name:</b> Han <b>Credentials (MD, MPH, etc.):</b> MSW</p> <p><b>Organization:</b> The Society of Thoracic Surgeons</p> <p><b>Street Address:</b> 633 N. Saint Clair St, Suite 2320 <b>City:</b> Chicago <b>State:</b> IL <b>ZIP:</b> 60611</p> <p><b>Email:</b> <a href="mailto:jhan@sts.org">jhan@sts.org</a> <b>Telephone:</b> 312-202-5856 ext:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| 42                         | <p><b>Measure Developer Point of Contact</b> <b>If different from Measure Steward</b></p> <p><b>First Name:</b>      <b>MI:</b>      <b>Last Name:</b>      <b>Credentials (MD, MPH, etc.):</b></p> <p><b>Organization:</b></p> <p><b>Street Address:</b>      <b>City:</b>      <b>State:</b>      <b>ZIP:</b></p> <p><b>Email:</b>      <b>Telephone:</b>      ext:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| ADDITIONAL INFORMATION     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| 43                         | <p><b>Workgroup/Expert Panel involved in measure development</b> <a href="#">Workgroup/panel used</a></p> <p>► If workgroup used, describe the members' role in measure development: <a href="#">The STS Task Force to Develop NQF Indicators for Pediatric and Congenital Cardiac Surgery</a> members collectively formulated the numerator statement and defined its parameters in addition to identifying data elements and sources of data.</p> <p>► Provide a list of workgroup/panel members' names and organizations:</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Institution</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Erle H. Austin, III, MD</td> <td>University of Louisville<br/>Kosair Children's Hospital</td> <td>Louisville, KY</td> </tr> <tr> <td>Emile A. Bacha, MD</td> <td>Children's Hospital Boston<br/>Department of Cardiovascular Surgery</td> <td>Boston, MA</td> </tr> <tr> <td>Pedro J. del Nido, MD</td> <td>Children's Hospital Boston<br/>Department of Cardiac Surgery</td> <td>Boston, MA</td> </tr> <tr> <td>Charles D. Fraser, Jr., MD</td> <td>Texas Children's Hospital<br/>Division of Congenital Heart Surgery</td> <td>Houston, TX</td> </tr> <tr> <td>Frederick L. Grover, MD</td> <td>University of Colorado Health Sciences Center<br/>Department of Surgery</td> <td>Aurora, CO</td> </tr> <tr> <td>Jennifer C. Hirsch, MD</td> <td>University of Michigan Health System<br/>Section of Cardiac Surgery</td> <td>Ann Arbor, MI</td> </tr> <tr> <td>Jeffrey P. Jacobs, MD</td> <td>The Congenital Heart Institute of Florida</td> <td>Saint Petersburg, FL</td> </tr> <tr> <td>Marshall L. Jacobs, MD</td> <td>Cleveland Clinic<br/>Center for Pediatric and Congenital Heart Diseases</td> <td>Cleveland, OH</td> </tr> <tr> <td>David L. Morales, MD</td> <td>Texas Children's Hospital<br/>Division of Congenital Heart Surgery</td> <td>Houston, TX</td> </tr> <tr> <td>Kamal K. Pourmoghadam, MD</td> <td>Geisinger Medical Center<br/>Department of Pediatric Cardiac Surgery</td> <td>Danville, PA</td> </tr> <tr> <td>Jeffrey B. Rich, MD</td> <td>Mid-Atlantic Cardiothoracic Surgeons, Ltd.</td> <td>Norfolk, VA</td> </tr> <tr> <td>James S. Tweddell, MD</td> <td>Children's Hospital of Wisconsin<br/>Department of Cardiothoracic Surgery</td> <td>Milwaukee, WI</td> </tr> </tbody> </table> | Name                 | Institution | Location | Erle H. Austin, III, MD | University of Louisville<br>Kosair Children's Hospital | Louisville, KY | Emile A. Bacha, MD | Children's Hospital Boston<br>Department of Cardiovascular Surgery | Boston, MA | Pedro J. del Nido, MD | Children's Hospital Boston<br>Department of Cardiac Surgery | Boston, MA | Charles D. Fraser, Jr., MD | Texas Children's Hospital<br>Division of Congenital Heart Surgery | Houston, TX | Frederick L. Grover, MD | University of Colorado Health Sciences Center<br>Department of Surgery | Aurora, CO | Jennifer C. Hirsch, MD | University of Michigan Health System<br>Section of Cardiac Surgery | Ann Arbor, MI | Jeffrey P. Jacobs, MD | The Congenital Heart Institute of Florida | Saint Petersburg, FL | Marshall L. Jacobs, MD | Cleveland Clinic<br>Center for Pediatric and Congenital Heart Diseases | Cleveland, OH | David L. Morales, MD | Texas Children's Hospital<br>Division of Congenital Heart Surgery | Houston, TX | Kamal K. Pourmoghadam, MD | Geisinger Medical Center<br>Department of Pediatric Cardiac Surgery | Danville, PA | Jeffrey B. Rich, MD | Mid-Atlantic Cardiothoracic Surgeons, Ltd. | Norfolk, VA | James S. Tweddell, MD | Children's Hospital of Wisconsin<br>Department of Cardiothoracic Surgery | Milwaukee, WI |
| Name                       | Institution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location             |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Erle H. Austin, III, MD    | University of Louisville<br>Kosair Children's Hospital                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Louisville, KY       |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Emile A. Bacha, MD         | Children's Hospital Boston<br>Department of Cardiovascular Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Boston, MA           |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Pedro J. del Nido, MD      | Children's Hospital Boston<br>Department of Cardiac Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Boston, MA           |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Charles D. Fraser, Jr., MD | Texas Children's Hospital<br>Division of Congenital Heart Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Houston, TX          |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Frederick L. Grover, MD    | University of Colorado Health Sciences Center<br>Department of Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Aurora, CO           |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Jennifer C. Hirsch, MD     | University of Michigan Health System<br>Section of Cardiac Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ann Arbor, MI        |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Jeffrey P. Jacobs, MD      | The Congenital Heart Institute of Florida                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Saint Petersburg, FL |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Marshall L. Jacobs, MD     | Cleveland Clinic<br>Center for Pediatric and Congenital Heart Diseases                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Cleveland, OH        |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| David L. Morales, MD       | Texas Children's Hospital<br>Division of Congenital Heart Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Houston, TX          |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Kamal K. Pourmoghadam, MD  | Geisinger Medical Center<br>Department of Pediatric Cardiac Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Danville, PA         |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| Jeffrey B. Rich, MD        | Mid-Atlantic Cardiothoracic Surgeons, Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Norfolk, VA          |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| James S. Tweddell, MD      | Children's Hospital of Wisconsin<br>Department of Cardiothoracic Surgery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Milwaukee, WI        |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |
| 44                         | <p><b>Measure Developer/Steward Updates and Ongoing Maintenance</b></p> <p>Year the measure was first released: <a href="#">NA</a></p> <p>Month and Year of most recent revision: <a href="#">NA</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |             |          |                         |                                                        |                |                    |                                                                    |            |                       |                                                             |            |                            |                                                                   |             |                         |                                                                        |            |                        |                                                                    |               |                       |                                           |                      |                        |                                                                        |               |                      |                                                                   |             |                           |                                                                     |              |                     |                                            |             |                       |                                                                          |               |



|           |                                                                                                                                                                                     |
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|           | What is the frequency for review/update of this measure? <i>Once a year at STS Annual Meeting</i><br>When is the next scheduled review/update for this measure? <i>January 2011</i> |
| <b>45</b> | <b>Copyright statement/disclaimers:</b>                                                                                                                                             |
| <b>46</b> | <b>Additional Information:</b>                                                                                                                                                      |
| <b>47</b> | <b>I have checked that the submission is complete and any blank fields indicate that no information is provided.</b> <input checked="" type="checkbox"/>                            |
| <b>48</b> | <b>Date of Submission (MM/DD/YY):</b> <i>3/11/10</i>                                                                                                                                |

| Procedure Code | Description                                     | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10             | PFO, Primary closure                            | Suture closure of patent foramen ovale (PFO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 20             | ASD repair, Primary closure                     | Suture closure of secundum (most frequently), coronary sinus, sinus venosus or common atrium ASD.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 30             | ASD repair, Patch                               | Patch closure (using any type of patch material) of secundum, coronary sinus, or sinus venosus ASD.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 40             | ASD repair, Device                              | Closure of any type ASD (including PFO) using a device                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2110           | ASD repair, Patch + PAPVC repair                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 50             | ASD, Common atrium (single atrium), Septation   | Septation of common (single) atrium using any type patch material.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 60             | ASD creation/enlargement                        | Creation of an atrial septal defect or enlargement of an existing atrial septal defect using a variety of modalities including balloon septostomy, blade septostomy, or surgical septectomy. Creation may be accomplished with or without use of cardiopulmonary bypass.                                                                                                                                                                                                                                                |
| 70             | ASD partial closure                             | Intentional partial closure of any type ASD (partial suture or fenestrated patch closure).                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 80             | Atrial septal fenestration                      | Creation of a fenestration (window) in the septum between the atrial chambers. Usually performed using a hole punch, creating a specifically sized communication in patch material placed on the atrial septum.                                                                                                                                                                                                                                                                                                         |
| 85             | Atrial fenestration closure                     | Closure of previously created atrial fenestration using any method including device, primary suture, or patch.                                                                                                                                                                                                                                                                                                                                                                                                          |
| 100            | VSD repair, Primary closure                     | Suture closure of any type VSD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 110            | VSD repair, Patch                               | Patch closure (using any type of patch material) of any type VSD.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 120            | VSD repair, Device                              | Closure of any type VSD using a device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 130            | VSD, Multiple, Repair                           | Closure of more than one VSD using any method or combination of methods. Further information regarding each type of VSD closed and method of closure can be provided by additionally listing specifics for each VSD closed. In the case of multiple VSDs in which only one is closed the procedure should be coded as closure of a single VSD. The fundamental diagnosis, in this case, would be "VSD, Multiple" and a secondary diagnosis can be the morphological type of VSD that was closed at the time of surgery. |
| 140            | VSD creation/enlargement                        | Creation of a ventricular septal defect or enlargement of an existing ventricular septal defect.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 150            | Ventricular septal fenestration                 | Creation of a fenestration (window) in the septum between the ventricular chambers. Usually performed using a hole punch, creating a specifically sized communication in patch material placed on the ventricular septum.                                                                                                                                                                                                                                                                                               |
| 170            | AVC (AVSD) repair, Complete (CAVSD)             | Repair of complete AV canal (AVSD) using one- or two patch or other technique, with or without mitral valve cleft repair.                                                                                                                                                                                                                                                                                                                                                                                               |
| 180            | AVC (AVSD) repair, Intermediate (Transitional)  | Repair of intermediate AV canal (AVSD) using ASD and VSD patch, or ASD patch and VSD suture, or other technique, with or without mitral valve cleft repair.                                                                                                                                                                                                                                                                                                                                                             |
| 190            | AVC (AVSD) repair, Partial (Incomplete) (PAVSD) | Repair of partial AV canal defect (primum ASD), any technique, with or without repair of cleft mitral valve.                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2300           | Valvuloplasty, Common atrioventricular valve    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| 2250 | Valvuloplasty converted to valve replacement in the same operation, Common atrioventricular valve                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 2230 | Valve replacement, Common atrioventricular valve                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 210  | AP window repair                                                                                                               | Repair of AP window using one- or two-patch technique with cardiopulmonary bypass; or, without cardiopulmonary bypass, using transcatheter device or surgical closure.                                                                                                                                                                                                                                                                                                                                                |
| 220  | Pulmonary artery origin from ascending aorta (hemitruncus) repair                                                              | Repair of pulmonary artery origin from the ascending aorta by direct reimplantation, autogenous flap, or conduit, with or without use of cardiopulmonary bypass.                                                                                                                                                                                                                                                                                                                                                      |
| 230  | Truncus arteriosus repair                                                                                                      | Truncus arteriosus repair that most frequently includes patch VSD closure and placement of a conduit from RV to PA. In some cases, a conduit is not placed but an RV to PA connection is made by direct association. Very rarely, there is no VSD to be closed. Truncal valve repair or replacement should be coded separately (Valvuloplasty, Truncal valve; Valve replacement, Truncal valve), as would be the case as well with associated arch anomalies requiring repair (e.g., Interrupted aortic arch repair). |
| 240  | Valvuloplasty, Truncal valve                                                                                                   | Truncal valve repair, any type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 2290 | Valvuloplasty converted to valve replacement in the same operation, Truncal valve                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 250  | Valve replacement, Truncal valve                                                                                               | Replacement of the truncal valve with a prosthetic valve.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2220 | Truncus + Interrupted aortic arch repair (IAA) repair                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 260  | PAPVC repair                                                                                                                   | PAPVC repair revolves around whether an intracardiac baffle is created to redirect pulmonary venous return to the left atrium or if the anomalous pulmonary vein is translocated and                                                                                                                                                                                                                                                                                                                                  |
| 270  | PAPVC, Scimitar, Repair                                                                                                        | In scimitar syndrome, PAPVC repair also revolves around whether an intracardiac baffle is created to redirect pulmonary venous return to the left atrium or if the anomalous pulmonary vein is translocated and connected to the left atrium directly. If there is an associated ASD and it is closed, that procedure should also be listed. Occasionally an                                                                                                                                                          |
| 2120 | PAPVC repair, Baffle redirection to left atrium with systemic vein translocation (Warden) (SVC sewn to right atrial appendage) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 280  | TAPVC repair                                                                                                                   | Repair of TAPVC, any type. Issues surrounding TAPVC repair involve how the main pulmonary venous confluence anastomosis is fashioned, whether an associated ASD is closed or left open or enlarged (ASD closure and                                                                                                                                                                                                                                                                                                   |
| 2200 | TAPVC repair + Shunt - systemic-to-pulmonary                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| 290 | Cor triatriatum repair                             | Repair of cor triatriatum. Surgical decision making revolves around the approach to the membrane creating the cor triatriatum defect, how any associated ASD is closed, and how any associated anomalous pulmonary vein connection is addressed. Both ASD closure and anomalous pulmonary venous connection may be listed as separate procedures.                                                                                                                                                                                                                               |
| 300 | Pulmonary venous stenosis repair                   | Repair of pulmonary venous stenosis, whether congenital or acquired. Repair can be accomplished with a variety of approaches: sutureless, patch venoplasty, stent placement, etc.                                                                                                                                                                                                                                                                                                                                                                                               |
| 310 | Atrial baffle procedure (non-Mustard, non-Senning) | The atrial baffle procedure code is used primarily for repair of systemic venous anomalies, as in redirection of left superior vena cava drainage to the right atrium.                                                                                                                                                                                                                                                                                                                                                                                                          |
| 330 | Anomalous systemic venous connection repair        | With the exception of atrial baffle procedures (harvest code 310), anomalous systemic venous connection repair includes a range of surgical approaches, including, among others: ligation of anomalous vessels, reimplantation of anomalous vessels (with or without use of a conduit), or redirection of anomalous systemic venous flow through directly to the pulmonary circulation (bidirectional Glenn to redirect LSVC or RSVC to left or right pulmonary artery, respectively).                                                                                          |
| 340 | Systemic venous stenosis repair                    | Stenosis or obstruction of a systemic vein (most commonly SVC or IVC) may be relieved with patch or                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 350 | TOF repair, No ventriculotomy                      | Tetralogy of Fallot repair (assumes VSD closure and relief of pulmonary stenosis at one or more levels), without use of an incision in the infundibulum of the right ventricle for exposure. In most cases this would be a transatrial and transpulmonary artery approach to repair the VSD and relieve the pulmonary stenosis. If the main pulmonary artery incision is extended proximally through the pulmonary annulus, this must be considered "transannular" and thus a ventricular incision, though the length of the incision onto the ventricle itself may be minimal. |
| 360 | TOF repair, Ventriculotomy, Nontransannular patch  | Tetralogy of Fallot repair (assumes VSD closure and relief of pulmonary stenosis at one or more levels), with use of a ventriculotomy incision, but without placement of a trans-pulmonary annulus patch. If the main pulmonary artery incision is extended proximally through the pulmonary annulus, this must be considered "transannular" and thus a ventricular incision, though the length of the incision onto the ventricle itself may be minimal.                                                                                                                       |
| 370 | TOF repair, Ventriculotomy, Transannular patch     | Tetralogy of Fallot repair (assumes VSD closure and relief of pulmonary stenosis at one or more levels), with use of a ventriculotomy incision and placement of a trans-pulmonary annulus patch. If the main pulmonary artery incision is extended proximally through the pulmonary annulus, this must be considered "transannular" and thus a ventricular incision, though the length of the incision onto the ventricle itself may be minimal.                                                                                                                                |

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| 380  | TOF repair, RV-PA conduit                                                     | Tetralogy of Fallot repair (assumes VSD closure and relief of pulmonary stenosis at one or more levels), with placement of a right ventricle-to-pulmonary artery conduit. In this procedure the major components of pulmonary stenosis are relieved with placement of the RV-PA conduit.                                                                                                                                                                                                                                                                                                                                                                                       |
| 390  | TOF - AVC (AVSD) repair                                                       | Tetralogy of Fallot repair (assumes VSD closure and relief of pulmonary stenosis at one or more levels), with repair of associated AV canal defect. Repair of associated atrial septal defect or atrioventricular valve repair(s) should be listed as additional or secondary procedures under the primary TOF-AVC procedure.                                                                                                                                                                                                                                                                                                                                                  |
| 400  | TOF - Absent pulmonary valve repair                                           | Repair of tetralogy of Fallot with absent pulmonary valve complex. In most cases this repair will involve pulmonary valve replacement (pulmonary or aortic homograft, porcine, other) and reduction pulmonary artery arterioplasty.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 420  | Pulmonary atresia - VSD (including TOF, PA) repair                            | For patients with pulmonary atresia with ventricular septal defect without MAPCAs, including those with tetralogy of Fallot with pulmonary atresia, repair may entail either a tetralogy-like repair with transannular patch placement, a VSD closure with placement of an RV-PA conduit, or an intraventricular tunnel VSD closure with transannular patch or RV-PA conduit placement. To assure an accurate count of repairs of pulmonary atresia-VSD without MAPCAs, even if a tetralogy-type repair or Rastelli-type repair is used, the pulmonary atresia-VSD code should be the code used, not Rastelli procedure or tetralogy of Fallot repair with transannular patch. |
| 430  | Pulmonary atresia - VSD - MAPCA (pseudotruncus) repair                        | In the presence of MAPCAs, this code implies pulmonary unifocalization (multi- or single-stage), repair of VSD (may be intraventricular tunnel or flat patch VSD closure), and placement of an RV-PA conduit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 440  | Unifocalization MAPCA(s)                                                      | Anastomosis of aortopulmonary collateral arteries into the left, right, or main pulmonary artery or into a tube graft or other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 450  | Occlusion MAPCA(s)                                                            | Occlusion, or closing off, of MAPCAs. This may be done with a transcatheter occluding device, usually a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 460  | Valvuloplasty, Tricuspid                                                      | Reconstruction of the tricuspid valve may include but not be limited to a wide range of techniques including: leaflet patch extension, artificial chordae placement, papillary muscle translocation with or without detachment. Annuloplasty techniques that may be done solely or in combination with leaflet, chordae or muscle repair to achieve a competent valve include: eccentric annuloplasty, Kay annular plication, purse-                                                                                                                                                                                                                                           |
| 2280 | Valvuloplasty converted to valve replacement in the same operation, Tricuspid |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| 465 | Ebstein's repair                                                                     | To assure an accurate count of repairs of Ebstein's anomaly of the tricuspid valve, this procedure code was included. Repair of Ebstein's anomaly may include, among other techniques, repositioning of the tricuspid valve, plication of the atrialized right ventricle, or right reduction atrioplasty. Often associated ASD's may be closed and arrhythmias addressed with surgical ablation procedures. These procedures should be entered as separate procedure codes. |
| 470 | Valve replacement, Tricuspid (TVR)                                                   | Replacement of the tricuspid valve with a prosthetic valve.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 480 | Valve closure, Tricuspid (exclusion, univentricular approach)                        | In a functional single ventricle heart, the tricuspid valve may be closed using a patch, thereby excluding the RV. Tricuspid valve closure may be used for infants with Ebstein's anomaly and                                                                                                                                                                                                                                                                               |
| 490 | Valve excision, Tricuspid (without replacement)                                      | Excision of the tricuspid valve without placement of a valve prosthesis.                                                                                                                                                                                                                                                                                                                                                                                                    |
| 500 | Valve surgery, Other, Tricuspid                                                      | Other tricuspid valve surgery not specified in procedure codes.                                                                                                                                                                                                                                                                                                                                                                                                             |
| 510 | RVOT procedure                                                                       | Included in this procedural code would be all RVOT procedures not elsewhere specified in the nomenclature system. These might be, among others: resection of subvalvar pulmonary stenosis (not DCRV type; may be localized fibrous diaphragm or high infundibular stenosis), right ventricular patch augmentation, or reduction pulmonary artery arterioplasty.                                                                                                             |
| 520 | 1 1/2 ventricular repair                                                             | Partial biventricular repair; includes intracardiac repair with bidirectional cavopulmonary anastomosis to volume unload a small ventricle or poorly functioning ventricle                                                                                                                                                                                                                                                                                                  |
| 530 | PA, reconstruction (plasty), Main (trunk)                                            | Reconstruction of the main pulmonary artery trunk commonly using patch material. If balloon angioplasty is performed or a stent is placed in the main pulmonary artery intraoperatively, this code may be used in addition to the balloon dilation or stent placement code. If MPA reconstruction is performed with PA debanding, both codes should be listed.                                                                                                              |
| 540 | PA, reconstruction (plasty), Branch, Central (within the hilar bifurcation)          | Reconstruction of the right or left branch (or both right and left) pulmonary arteries (within the hilar bifurcation) commonly using patch material. If balloon angioplasty is performed or a stent is placed in the right or left (or both) pulmonary artery intraoperatively, this code may be used in addition to the <u>balloon dilation or stent placement code</u> . If, rarely, branch PA                                                                            |
| 550 | PA, reconstruction (plasty), Branch, Peripheral (at or beyond the hilar bifurcation) | Reconstruction of the peripheral right or left branch (or both right and left) pulmonary arteries (at or beyond the hilar bifurcation) commonly using patch material. If balloon angioplasty is performed or a stent is placed in the right or left (or both) peripheral pulmonary artery intraoperatively, this code may be used in addition to the balloon dilation or stent placement code.                                                                              |



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| 570  | DCRV repair                                                                                      | Surgical repair of DCRV combines relief of the low infundibular stenosis (via muscle resection) and closure of a VSD when present. A ventriculotomy may be required and is repaired by patch enlargement of the infundibulum. VSD closure and patch enlargement of the infundibulum, if done, should be listed as separate procedure codes.                                                                                                                                                                                           |
| 590  | Valvuloplasty, Pulmonic                                                                          | Valvuloplasty of the pulmonic valve may include a range of techniques including but not limited to: valvotomy with or without bypass, commissurotomy, and valvuloplasty.                                                                                                                                                                                                                                                                                                                                                              |
| 2270 | Valvuloplasty converted to valve replacement in the same operation, Pulmonic                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 600  | Valve replacement, Pulmonic (PVR)                                                                | Replacement of the pulmonic valve with a prosthetic valve. Care must be taken to differentiate between homograft pulmonic valve replacement and placement of a homograft RV-PA conduit.                                                                                                                                                                                                                                                                                                                                               |
| 630  | Valve excision, Pulmonary (without replacement)                                                  | Excision of the pulmonary valve without placement of a valve prosthesis.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 640  | Valve closure, Semilunar                                                                         | Closure of a semilunar valve (pulmonic or aortic) by any technique.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 650  | Valve surgery, Other, Pulmonic                                                                   | Other pulmonic valve surgery not specified in procedure codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 610  | Conduit placement, RV to PA                                                                      | Placement of a conduit, any type, from RV to PA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 620  | Conduit placement, LV to PA                                                                      | Placement of a conduit, any type, from LV to PA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1774 | Conduit placement, Ventricle to aorta                                                            | Placement of a conduit from the right or left ventricle to the aorta.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1772 | Conduit placement, Other                                                                         | Placement of a conduit from any chamber or vessel to any vessel, valved or valveless, not listed elsewhere.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 580  | Conduit reoperation                                                                              | Conduit reoperation is the code to be used in the event of conduit failure, in whatever position (LV to aorta, LV to PA, RA to RV, RV to aorta, RV to PA, etc.), and from whatever cause (somatic growth, stenosis, insufficiency, infection, etc).                                                                                                                                                                                                                                                                                   |
| 660  | Valvuloplasty, Aortic                                                                            | Valvuloplasty of the aortic valve for stenosis and/or insufficiency including, but not limited to the following techniques: valvotomy (open or closed), commissurotomy, aortic valve suspension, leaflet (left, right or noncoronary) partial resection, reduction, or leaflet shaving, extended valvuloplasty (freeing of leaflets, commissurotomy, and extension of leaflets using autologous or bovine pericardium), or annuloplasty (partial - interrupted or noncircumferential sutures, or complete - circumferential sutures). |
| 2240 | Valvuloplasty converted to valve replacement in the same operation, Aortic                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 2310 | Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross procedure |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| 2320 | Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross-Konno procedure |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 670  | Valve replacement, Aortic (AVR)                                                                        | Replacement of the aortic valve with a prosthetic valve (mechanical, bioprosthetic, or homograft). Use this code only if type of valve prosthesis is unknown or does not fit into the specific valve replacement codes available. Autograft valve replacement should be coded as a Ross procedure.                                                                                                                                                                   |
| 680  | Valve replacement, Aortic (AVR), Mechanical                                                            | Replacement of the aortic valve with a mechanical prosthetic valve.                                                                                                                                                                                                                                                                                                                                                                                                  |
| 690  | Valve replacement, Aortic (AVR), Bioprosthetic                                                         | Replacement of the aortic valve with a bioprosthetic prosthetic valve.                                                                                                                                                                                                                                                                                                                                                                                               |
| 700  | Valve replacement, Aortic (AVR), Homograft                                                             | Replacement of the aortic valve with a homograft prosthetic valve.                                                                                                                                                                                                                                                                                                                                                                                                   |
| 715  | Aortic root replacement, Bioprosthetic                                                                 | Replacement of the aortic root (that portion of the aorta attached to the heart; it gives rise to the coronary arteries) with a bioprosthesis (e.g., porcine) in a conduit, often composite.                                                                                                                                                                                                                                                                         |
| 720  | Aortic root replacement, Mechanical                                                                    | Replacement of the aortic root (that portion of the aorta attached to the heart; it gives rise to the coronary arteries) with a mechanical prosthesis in a composite conduit.                                                                                                                                                                                                                                                                                        |
| 730  | Aortic root replacement, Homograft                                                                     | Replacement of the aortic root (that portion of the aorta attached to the heart; it gives rise to the coronary arteries) with a homograft.                                                                                                                                                                                                                                                                                                                           |
| 735  | Aortic root replacement, Valve sparing                                                                 | Replacement of the aortic root (that portion of the aorta attached to the heart; it gives rise to the coronary arteries) without replacing the aortic valve (using a tube graft).                                                                                                                                                                                                                                                                                    |
| 740  | Ross procedure                                                                                         | Replacement of the aortic valve with a pulmonary autograft and replacement of the pulmonary valve with a homograft conduit.                                                                                                                                                                                                                                                                                                                                          |
| 750  | Konno procedure                                                                                        | Relief of left ventricular outflow tract obstruction associated with aortic annular hypoplasia, aortic valvar stenosis and/or aortic valvar insufficiency via Konno aortoventriculoplasty. Components of the surgery include a longitudinal incision in the aortic septum, a vertical incision in the outflow tract of the right ventricle to join the septal incision, aortic valve replacement, and patch reconstruction of the outflow tracts of both ventricles. |
| 760  | Ross-Konno procedure                                                                                   | Relief of left ventricular outflow tract obstruction associated with aortic annular hypoplasia, aortic valvar stenosis and/or aortic valvar insufficiency via Konno aortoventriculoplasty using a pulmonary autograft root for the aortic root replacement.                                                                                                                                                                                                          |
| 770  | Other annular enlargement procedure                                                                    | Techniques included under this procedure code include those designed to effect aortic annular enlargement that are not included in other procedure codes. These include the Manouagian and Nicks aortic annular enlargement procedures.                                                                                                                                                                                                                              |

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| 780  | Aortic stenosis, Subvalvar, Repair                                         | Subvalvar aortic stenosis repair by a range of techniques including excision, excision and myotomy, excision and myomectomy, myotomy, myomectomy, initial placement of apical-aortic conduit (LV to aorta conduit replacement would be coded as conduit reoperation), Vouhé aortoventriculoplasty (aortic annular incision at commissure of left and right coronary cusps is carried down to the septum and RV infundibulum; septal muscle is resected, incisions are closed, and the aortic annulus is reconstituted), or other aortoventriculoplasty techniques.                                                                                                                                                                                                                                                                                                                     |
| 2100 | Aortic stenosis, Subvalvar, Repair, With myectomy for IHSS                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 790  | Aortic stenosis, Supravalvar, Repair                                       | Repair of supravalvar aortic stenosis involving all techniques of patch aortoplasty and aortoplasty involving the use of all autologous tissue. In simple patch aortoplasty a diamond-shaped patch may be used, in the Doty technique an extended patch is placed (Y shaped patch, incision carried into two sinuses), and in the Brom repair the ascending aorta is transected, any fibrous ridge is resected, and the three sinuses are patched separately.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 800  | Valve surgery, Other, Aortic                                               | Other aortic valve surgery not specified in other procedure codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 810  | Sinus of Valsalva, Aneurysm repair                                         | Sinus of Valsalva aneurysm repair can be organized by site of aneurysm (left, right or noncoronary sinus), type of repair (suture, patch graft, or root repair by tube graft or valved conduit), and approach used (from chamber of origin (aorta) or from chamber of penetration (LV, RV, PA, left or right atrium, etc.)). Aortic root replacement procedures in association with sinus of Valsalva aneurysm repairs are usually for associated uncorrectable aortic insufficiency or multiple sinus involvement and the aortic root replacement procedure should also be listed. Additional procedures also performed at the time of sinus of Valsalva aneurysm repair include but are not limited to VSD closure, repair or replacement of aortic valve, and coronary reconstruction; these procedures should also be coded separately from the sinus of Valsalva aneurysm repair. |
| 820  | LV to aorta tunnel repair                                                  | LV to aorta tunnel repair can be accomplished by suture, patch, or both, and may require reimplantation of the right coronary artery. Associated coronary artery procedures should be coded separately from the LV to aorta tunnel repair.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 830  | Valvuloplasty, Mitral                                                      | Repair of mitral valve including, but not limited to: valvotomy (closed or open heart), cleft repair, annuloplasty with or without ring, chordal reconstruction, commissurotomy, leaflet repair, or papillary muscle repair.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2260 | Valvuloplasty converted to valve replacement in the same operation, Mitral |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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| 840  | Mitral stenosis, Supravalvar mitral ring repair           | Supravalvar mitral ring repair.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 850  | Valve replacement, Mitral (MVR)                           | Replacement of mitral valve with prosthetic valve, any kind, in suprannular or annular position.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 860  | Valve surgery, Other, Mitral                              | Other mitral valve surgery not specified in procedure codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 870  | Norwood procedure                                         | <p>The Norwood operation is synonymous with the term 'Norwood (Stage 1)' and is defined as an aortopulmonary connection and neoaortic arch construction resulting in univentricular physiology and pulmonary blood flow controlled with a calibrated systemic-to-pulmonary artery shunt, or a right ventricle to pulmonary artery conduit, or rarely, a cavopulmonary connection. When coding the procedure "Norwood procedure", the primary procedure of the operation should be "Norwood procedure". The second procedure (Procedure 2 after the Norwood procedure) must then document the source of pulmonary blood flow and be chosen from the following eight choices:</p> <ol style="list-style-type: none"> <li>1. Shunt, Systemic to pulmonary, Modified Blalock-Taussig Shunt (MBTS)</li> <li>2. Shunt, Systemic to pulmonary, Central (from aorta or to main pulmonary artery)</li> <li>3. Shunt, Systemic to pulmonary, Other</li> <li>4. Conduit placement, RV to PA</li> <li>5. Bidirectional cavopulmonary anastomosis (BDCPA) (bidirectional Glenn)</li> <li>6. Glenn (unidirectional cavopulmonary anastomosis) (unidirectional Glenn)</li> <li>7. Bilateral bidirectional cavopulmonary anastomosis (BBDCPA) (bilateral bidirectional Glenn)</li> <li>8. HemiFontan</li> </ol> |
| 880  | HLHS biventricular repair                                 | Performed in patients who have small but adequately sized ventricles to support systemic circulation. These patients usually have small, but not stenotic, aortic and/or mitral valves. Primary biventricular repair has consisted of extensive aortic arch and ascending aorta enlargement with a patch, closure of interventricular and interatrial communications, and conservative approach for left ventricular outflow tract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2160 | Hybrid Approach "Stage 1", Application of RPA & LPA bands | A "Hybrid Procedure" is defined as a procedure that combines surgical and transcatheter interventional approaches. The term "Hybrid approach" is used somewhat differently than the term "Hybrid Procedure". A "Hybrid approach" is defined as any of a group of procedures that fit into the general silo of procedures developed from the combined use of surgical and transcatheter interventional techniques. Therefore, not all procedures classified as "Hybrid approach" are truly "Hybrid Procedures".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2170 | Hybrid Approach "Stage 1",<br>Stent placement in arterial duct (PDA)                                                                                                                                               | A "Hybrid Procedure" is defined as a procedure that combines surgical and transcatheter interventional approaches. The term "Hybrid approach" is used somewhat differently than the term "Hybrid Procedure". A "Hybrid approach" is defined as any of a group of procedures that fit into the general silo of procedures developed from the combined use of surgical and transcatheter interventional techniques. Therefore, not all procedures classified as "Hybrid approach" are truly "Hybrid Procedures".                                                                                                                                                                                                                                                                                                                                                            |
| 2180 | Hybrid Approach "Stage 1",<br>Stent placement in arterial duct (PDA) + application of RPA & LPA bands                                                                                                              | A "Hybrid Procedure" is defined as a procedure that combines surgical and transcatheter interventional approaches. The term "Hybrid approach" is used somewhat differently than the term "Hybrid Procedure". A "Hybrid approach" is defined as any of a group of procedures that fit into the general silo of procedures developed from the combined use of surgical and transcatheter interventional techniques. Therefore, not all procedures classified as "Hybrid approach" are truly "Hybrid Procedures".                                                                                                                                                                                                                                                                                                                                                            |
| 2140 | Hybrid approach "Stage 2",<br>Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Aortic arch repair (Norwood [Stage 1] + Superior Cavopulmonary anastomosis(es) + PA Debanding) | A "Hybrid Procedure" is defined as a procedure that combines surgical and transcatheter interventional approaches. The term "Hybrid approach" is used somewhat differently than the term "Hybrid Procedure". A "Hybrid approach" is defined as any of a group of procedures that fit into the general silo of procedures developed from the combined use of surgical and transcatheter interventional techniques. Therefore, not all procedures classified as "Hybrid approach" are truly "Hybrid Procedures". It should be acknowledged that a Hybrid approach "Stage 2" (Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding, with or without Aortic arch repair) gets its name not because it has any actual hybrid elements, but because it is part of a planned staged approach that is typically commenced with a hybrid procedure. |
| 2150 | Hybrid approach "Stage 2",<br>Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Without aortic arch repair                                                                     | A "Hybrid Procedure" is defined as a procedure that combines surgical and transcatheter interventional approaches. The term "Hybrid approach" is used somewhat differently than the term "Hybrid Procedure". A "Hybrid approach" is defined as any of a group of procedures that fit into the general silo of procedures developed from the combined use of surgical and transcatheter interventional techniques. Therefore, not all procedures classified as "Hybrid approach" are truly "Hybrid Procedures". It should be acknowledged that a Hybrid approach "Stage 2" (Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding, with or without Aortic arch repair) gets its name not because it has any actual hybrid elements, but because it is part of a planned staged approach that is typically commenced with a hybrid procedure  |

|      |                                                                          |                                                                                                                                                                                                                                        |
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| 890  | Transplant, Heart                                                        | Heart transplantation, any technique, allograft or xenograft.                                                                                                                                                                          |
| 900  | Transplant, Heart and lung                                               | Heart and lung (single or double) transplantation.                                                                                                                                                                                     |
| 910  | Partial left ventriculectomy (LV volume reduction surgery) (Batista)     | Wedge resection of LV muscle, with suturing of cut edges together, to reduce LV volume.                                                                                                                                                |
| 920  | Pericardial drainage procedure                                           | Pericardial drainage can include a range of therapies including, but not limited to: pericardiocentesis, pericardiostomy tube placement, pericardial window creation, and open pericardial drainage (pericardiotomy).                  |
| 930  | Pericardiectomy                                                          | Surgical removal of the pericardium.                                                                                                                                                                                                   |
| 940  | Pericardial procedure, Other                                             | Other pericardial procedures that include, but are not limited to: pericardial reconstruction for congenital absence of the pericardium, pericardial biopsy, pericardial mass or cyst excision.                                        |
| 950  | Fontan, Atrio-pulmonary connection                                       | Fontan-type procedure with atrio-pulmonary connection.                                                                                                                                                                                 |
| 960  | Fontan, Atrio-ventricular connection                                     | Fontan-type procedure with atrio-ventricular connection, either direct or with RA-RV conduit, valved or nonvalved.                                                                                                                     |
| 970  | Fontan, TCPC, Lateral tunnel, Fenestrated                                | Total cavopulmonary connection using an intraatrial lateral tunnel construction, with fenestration.                                                                                                                                    |
| 980  | Fontan, TCPC, Lateral tunnel, Nonfenestrated                             | Total cavopulmonary connection using an intraatrial lateral tunnel construction, with no fenestration.                                                                                                                                 |
| 1000 | Fontan, TCPC, External conduit, Fenestrated                              | Total cavopulmonary connection using an external conduit to connect the infradiaphragmatic systemic venous return to the pulmonary artery, with fenestration.                                                                          |
| 1010 | Fontan, TCPC, External conduit, Nonfenestrated                           | Total cavopulmonary connection using an external conduit to connect the infradiaphragmatic systemic venous return to the pulmonary artery, with no fenestration.                                                                       |
| 1025 | Fontan revision or conversion (Re-do Fontan)                             | Revision of a previous Fontan procedure to a total cavopulmonary connection.                                                                                                                                                           |
| 1030 | Fontan, Other                                                            | Other Fontan procedure not specified in procedure codes. May include takedown of a Fontan procedure.                                                                                                                                   |
| 2340 | Fontan + Atrioventricular valvuloplasty                                  |                                                                                                                                                                                                                                        |
| 1035 | Ventricular septation                                                    | Creation of a prosthetic ventricular septum. Surgical procedure used to septate univentricular hearts with two atrioventricular valves. Additional procedures, such as resection of subpulmonic stenosis, should be listed separately. |
| 1050 | Congenitally corrected TGA repair, Atrial switch and ASO (double switch) | Repair of congenitally corrected TGA by concomitant atrial switch (Mustard or Senning) and arterial switch operation. VSD closure is usually performed as well; this should be coded separately.                                       |
| 1060 | Congenitally corrected TGA repair, Atrial switch and Rastelli            | Repair of congenitally corrected TGA by concomitant atrial switch (Mustard or Senning) and VSD closure to the aortic valve with placement of an RV-to-PA conduit.                                                                      |
| 1070 | Congenitally corrected TGA repair, VSD closure                           | Repair of congenitally corrected TGA by VSD closure only.                                                                                                                                                                              |

|      |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                              |
|------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1080 | Congenitally corrected TGA repair, VSD closure and LV to PA conduit | Repair of congenitally corrected TGA by VSD closure and placement of an LV-to-PA conduit.                                                                                                                                                                                                                                                                                                    |
| 1090 | Congenitally corrected TGA repair, Other                            | Any procedures for correction of CCTGA not otherwise specified in other listed procedure codes.                                                                                                                                                                                                                                                                                              |
| 1110 | Arterial switch operation (ASO)                                     | Arterial switch operation is used for repair of transposition of the great arteries (TGA). The pulmonary artery and aorta are transected and translocated so that the pulmonary artery arises from the right ventricle and the aorta from the left ventricle. Coronary artery transfer is also accomplished.                                                                                 |
| 1120 | Arterial switch operation (ASO) and VSD repair                      | Arterial switch operation is used for repair of transposition of the great arteries (TGA). The pulmonary artery and aorta are transected and translocated so that the pulmonary artery arises from the right ventricle and the aorta from the left ventricle. Coronary artery transfer is also accomplished. The VSD is closed, usually with a patch.                                        |
| 1123 | Arterial switch procedure + Aortic arch repair                      | Concomitant arterial switch operation and repair of the aortic arch in patients with transposition of the great arteries with intact ventricular septum and associated coarctation of the aorta or interrupted aortic arch.                                                                                                                                                                  |
| 1125 | Arterial switch procedure and VSD repair + Aortic arch repair       | Concomitant arterial switch operation with VSD closure and repair of aortic arch in patients with transposition of the great arteries with VSD and associated coarctation of the aorta or interrupted aortic arch.                                                                                                                                                                           |
| 1130 | Senning                                                             | Atrial baffle procedure for rerouting of venous flow in TGA effecting a "physiological repair". The caval flow is directed behind the baffle to the mitral valve, left ventricle and pulmonary artery while the pulmonary venous flow is directed in front of the baffle to the tricuspid valve, right ventricle, and aorta. The Senning procedure uses atrial wall to construct the baffle. |
| 1140 | Mustard                                                             | Atrial baffle procedure for rerouting of venous flow in TGA effecting a "physiological repair". The caval flow is directed behind the baffle to the mitral valve, left ventricle and pulmonary artery while pulmonary venous flow is directed in front of the baffle to the tricuspid valve, right ventricle, and aorta. The Mustard procedure uses patch material to construct the baffle.  |
| 1145 | Atrial baffle procedure, Mustard or Senning revision                | Revision of a previous atrial baffle procedure (either Mustard or Senning), for any reason (e.g., obstruction, baffle leak).                                                                                                                                                                                                                                                                 |
| 1150 | Rastelli                                                            | Most often used for patients with TGA-VSD and significant LVOTO, the Rastelli operation consists of an                                                                                                                                                                                                                                                                                       |



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| 1160 | REV                                                                          | The Lecompte (REV) intraventricular repair is designed for patients with abnormalities of ventriculoarterial connection in whom a standard intraventricular tunnel repair cannot be performed. It is also suitable for patients in whom an arterial switch procedure with tunneling of the VSD to the pulmonary artery cannot be performed because of pulmonary (left ventricular outflow tract) stenosis. A right ventriculotomy incision is made. The infundibular (conal) septum, located between the two semilunar valves, is aggressively resected if its presence interferes with the construction of a tunnel from the VSD to the aorta. The VSD is then tunneled to the aorta. The decision to perform or not to perform the Lecompte maneuver should be made at the beginning of the operation. If the Lecompte maneuver is not performed the pulmonary artery is translocated to the right ventricular outflow tract on the side of the aorta that provides the shortest route. (When the decision to perform the Lecompte maneuver has been made, the great vessels are transected and this maneuver is performed at the |
| 2190 | Aortic root translocation over left ventricle (Including Nikaidoh procedure) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2210 | TGA, Other procedures (Kawashima, LV-PA conduit, other)                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1180 | DORV, Intraventricular tunnel repair                                         | Repair of DORV using a tunnel closure of the VSD to the aortic valve. This also includes the posterior straight tunnel repair of Kawashima                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1200 | DOLV repair                                                                  | Because of the morphologic variability of DOLV, there are many approaches to repair, including: intraventricular tunnel repair directing the VSD to the pulmonary valve, the REV procedure, or the Rastelli procedure. In the case of DOLV use this code for tunnel closure to the pulmonary valve. If the REV or Rastelli procedures are performed then use those respective codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1210 | Coarctation repair, End to end                                               | Repair of coarctation of aorta by excision of the coarctation segment and end-to-end circumferential anastomosis of the aorta.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1220 | Coarctation repair, End to end, Extended                                     | Repair of coarctation of the aorta by excision of the coarctation segment and end-to-end anastomosis of the oblique ends of the aorta, creating an extended anastomosis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1230 | Coarctation repair, Subclavian flap                                          | Repair of coarctation of the aorta by ligating, dividing, and opening the subclavian artery, incising the coarctation site, and folding down the subclavian artery onto the incision in the aorta, suturing the subclavian "flap" in place, creating a roof over the area of the previous coarctation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1240 | Coarctation repair, Patch aortoplasty                                        | Repair of coarctation of the aorta by incising the coarctation site with placement of a patch sutured in place longitudinally along the aortotomy edge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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| 1250 | Coarctation repair, Interposition graft                          | Repair of coarctation of the aorta by resection of the coarctation segment and placement of a prosthetic tubular interposition graft anastomosed circumferentially to the cut ends of the aorta.                                                                                                                             |
| 1260 | Coarctation repair, Other                                        | Any repair of coarctation not specified in procedure codes. This may include, for example, a combination of two approaches for coarctation repair or extra-anatomic bypass graft, etc.                                                                                                                                       |
| 1275 | Coarctation repair + VSD repair                                  | Coarctation of aorta repair, any technique, and simultaneous VSD repair, any type VSD, any type repair.                                                                                                                                                                                                                      |
| 1280 | Aortic arch repair                                               | Aortic arch repair, any technique.                                                                                                                                                                                                                                                                                           |
| 1285 | Aortic arch repair + VSD repair                                  | Aortic arch repair, any technique, and simultaneous VSD repair, any type VSD, any type repair. This includes repair of IAA with VSD.                                                                                                                                                                                         |
| 1290 | Coronary artery fistula ligation                                 | Coronary artery fistula repair using any technique. If additional technique information may be supplied by another procedure code, please list separately (e.g., bypass graft).                                                                                                                                              |
| 1291 | Anomalous origin of coronary artery from pulmonary artery repair | Repair of anomalous origin of the coronary artery (any) from the pulmonary artery, by any technique (ligation, translocation with aortic implantation, Takeuchi operation, bypass graft). If additional technique information may be supplied by another procedure code, please list separately (for example, bypass graft). |
| 1300 | Coronary artery bypass                                           | Coronary artery bypass graft procedure, any technique (with or without CPB, venous or arterial graft, one or more grafts, etc.), for any coronary artery pathology (coronary arterial fistula, aneurysm, coronary bridging, atresia of left main, acquired coronary artery disease, etc.).                                   |
| 1310 | Coronary artery procedure, Other                                 | Any coronary artery procedure not specifically listed.                                                                                                                                                                                                                                                                       |
| 1320 | Interrupted aortic arch repair                                   | Repair of interrupted aortic arch (any type) by any technique (direct anastomosis, prosthetic graft, etc). Does not include repair of IAA-VSD.                                                                                                                                                                               |
| 1330 | PDA closure, Surgical                                            | Closure of a PDA by any surgical technique (ligation, division, clip) using any approach (i.e., thoracotomy, thoracoscopic, etc).                                                                                                                                                                                            |
| 1340 | PDA closure, Device                                              | Closure of a PDA by device using transcatheter techniques.                                                                                                                                                                                                                                                                   |
| 1360 | Vascular ring repair                                             | Repair of vascular ring (any type, except pulmonary artery sling) by any technique.                                                                                                                                                                                                                                          |
| 1365 | Aortopexy                                                        | Surgical fixation of the aorta to another structure (usually the posterior aspect of the sternum) to relieve compression on another vessel or structure (e.g., trachea).                                                                                                                                                     |
| 1370 | Pulmonary artery sling repair                                    | Pulmonary artery sling repair by any technique.                                                                                                                                                                                                                                                                              |
| 1380 | Aortic aneurysm repair                                           | Aortic aneurysm repair by any technique.                                                                                                                                                                                                                                                                                     |
| 1390 | Aortic dissection repair                                         | Aortic dissection repair by any technique                                                                                                                                                                                                                                                                                    |
| 1410 | Transplant, lung(s)                                              | Lung or lobe transplantation of any type.                                                                                                                                                                                                                                                                                    |

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|------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1450 | Pacemaker implantation, Permanent                                                           | Implantation of a permanent pacemaker of any type (e.g., single-chamber, dual-chamber, atrial antitachycardia), with any lead configuration or type (atrial, ventricular, atrial and ventricular, transvenous, epicardial, transmural), by any technique (sternotomy, thoracotomy etc). |
| 1460 | Pacemaker procedure                                                                         | Any revision to a previously placed pacemaker system including revisions to leads, generators, pacemaker pockets. This may include explantation of pacemakers or leads as well.                                                                                                         |
| 2350 | Explantation of pacing system                                                               |                                                                                                                                                                                                                                                                                         |
| 1470 | ICD (AICD) implantation                                                                     | Implantation of an (automatic) implantable cardioverter defibrillator system.                                                                                                                                                                                                           |
| 1480 | ICD (AICD) ([automatic] implantable cardioverter defibrillator) procedure                   | Any revision to a previously placed AICD including revisions to leads, pads, generators, pockets. This may include explantation procedures as well.                                                                                                                                     |
| 1490 | Arrhythmia surgery - atrial, Surgical Ablation                                              | Surgical ablation (any type) of any atrial arrhythmia.                                                                                                                                                                                                                                  |
| 1500 | Arrhythmia surgery - ventricular, Surgical Ablation                                         | Surgical ablation (any type) of any ventricular arrhythmia.                                                                                                                                                                                                                             |
| 1590 | Shunt, Systemic to pulmonary, Modified Blalock-Taussig Shunt (MBTS)                         | Placement of a tube graft from a branch of the aortic arch to the pulmonary artery with or without bypass, from any approach (thoracotomy, sternotomy).                                                                                                                                 |
| 1600 | Shunt, Systemic to pulmonary, Central (from aorta or to main pulmonary artery)              | A direct anastomosis or placement of a tube graft from the aorta to the pulmonary artery with or without bypass, from any approach (thoracotomy, sternotomy).                                                                                                                           |
| 1610 | Shunt, Systemic to pulmonary, Other                                                         | Placement of any other systemic-to-pulmonary artery shunt, with or without bypass, from any approach (thoracotomy, sternotomy) that is not otherwise coded. Includes classic Blalock-Taussig systemic-to-pulmonary artery shunt.                                                        |
| 1630 | Shunt, Ligation and takedown                                                                | Takedown of any shunt.                                                                                                                                                                                                                                                                  |
| 2095 | Shunt, Reoperation                                                                          |                                                                                                                                                                                                                                                                                         |
| 1640 | PA banding (PAB)                                                                            | Placement of a pulmonary artery band, any type.                                                                                                                                                                                                                                         |
| 1650 | PA debanding                                                                                | Debanding of pulmonary artery. Please list separately any pulmonary artery reconstruction required.                                                                                                                                                                                     |
| 1660 | Damus-Kaye-Stansel procedure (DKS) (creation of AP anastomosis without arch reconstruction) | In the Damus-Kaye-Stansel procedure the proximal transected main pulmonary artery is connected by varying techniques to the aorta.                                                                                                                                                      |
| 1670 | Bidirectional cavopulmonary anastomosis (BDCPA) (bidirectional Glenn)                       | Superior vena cava to pulmonary artery anastomosis allowing flow to both pulmonary arteries with an end-to side superior vena-to-pulmonary artery anastomosis.                                                                                                                          |
| 1680 | Glenn (unidirectional cavopulmonary anastomosis) (unidirectional Glenn)                     | Superior vena cava to ipsilateral pulmonary artery anastomosis (i.e., LSVc to LPA, RSVc to RPA).                                                                                                                                                                                        |

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| 1690 | Bilateral bidirectional cavopulmonary anastomosis (BBDCPA) (bilateral bidirectional Glenn)    | Bilateral superior vena cava-to-pulmonary artery anastomoses (requires bilateral SVCs).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1700 | HemiFontan                                                                                    | A HemiFontan is an operation that includes a bidirectional superior vena cava (SVC)-to-pulmonary artery anastomosis and the connection of this "SVCpulmonary artery amalgamation" to the atrium, with a "dam" between this "SVC-pulmonary artery amalgamation" and the atrium. This operation can be accomplished with a variety of operative strategies including the following two techniques and other techniques that combine elements of both of these approaches: (1) Augmenting both branch pulmonary arteries with a patch and suturing the augmented branch pulmonary arteries to an incision in the medial aspect of the superior vena cava. (With this approach, the pulmonary artery patch forms a roof over the SVC-topulmonary artery anastomosis and also forms a "dam" between the SVC-pulmonary artery amalgamation and the right atrium.) (2) Anastomosing both ends of the divided SVC to incisions in the top and bottom of the right pulmonary artery, and using a separate patch to close junction of the SVC and the right atrium. |
| 2330 | Superior cavopulmonary anastomosis(es) (Glenn or HemiFontan) + Atrioventricular valvuloplasty |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2130 | Superior Cavopulmonary anastomosis(es) + PA reconstruction                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1720 | Aneurysm, Ventricular, Right, Repair                                                          | Repair of right ventricular aneurysm, any technique.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1730 | Aneurysm, Ventricular, Left, Repair                                                           | Repair of left ventricular aneurysm, any technique.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1740 | Aneurysm, Pulmonary artery, Repair                                                            | Repair of pulmonary artery aneurysm, any technique.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1760 | Cardiac tumor resection                                                                       | Resection of cardiac tumor, any type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1780 | Pulmonary AV fistula repair/occlusion                                                         | Repair or occlusion of a pulmonary arteriovenous fistula.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1790 | Ligation, Pulmonary artery                                                                    | Ligation or division of the pulmonary artery. Most often performed as a secondary procedure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1802 | Pulmonary embolectomy, Acute pulmonary embolus                                                | Acute pulmonary embolism (clot) removal, through catheter or surgery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1804 | Pulmonary embolectomy, Chronic pulmonary embolus                                              | Chronic pulmonary embolism (clot) removal, through catheter or surgery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1830 | Ligation, Thoracic duct                                                                       | Ligation of the thoracic duct; most commonly for persistent chylothorax.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1860 | Mediastinal procedure                                                                         | Any non-cardiovascular mediastinal procedure not otherwise listed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

























# The Society of Thoracic Surgeons Congenital Heart Surgery Database

Data Collection Form Version 3.0

September 16, 2009

## ADMINISTRATIVE

|                 |                        |
|-----------------|------------------------|
| Participant ID: | STS Trial Link Number: |
|-----------------|------------------------|

## DEMOGRAPHICS

|                                                                           |                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Patient ID (software generated)                                           | Patient SSN: ____ - ____ - ____                                                                                                                                                                                                      | MRN:                                                                                                                                                                                                                                   |
| Health Insurance Claim Number:                                            |                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                        |
| Patient Last Name:                                                        | Patient First Name:                                                                                                                                                                                                                  | Patient MI:                                                                                                                                                                                                                            |
| Patient Region:                                                           | Postal Code:                                                                                                                                                                                                                         | Country:                                                                                                                                                                                                                               |
| Birth City:                                                               | Birth Region:                                                                                                                                                                                                                        | Birth Country:                                                                                                                                                                                                                         |
| Mother's Last Name:                                                       | Mother's First Name:                                                                                                                                                                                                                 | Mother's MI:                                                                                                                                                                                                                           |
|                                                                           |                                                                                                                                                                                                                                      | Mother's SSN: ____ - ____ - ____                                                                                                                                                                                                       |
| DOB: (mm/dd/yyyy) ____ / ____ / ____                                      | Birth Weight (kg):                                                                                                                                                                                                                   | Gender: <input type="checkbox"/> M <input type="checkbox"/> F <input type="checkbox"/> Ambiguous                                                                                                                                       |
| Premature Birth: <input type="checkbox"/> Yes <input type="checkbox"/> No |                                                                                                                                                                                                                                      | Gestational age at birth (in weeks):                                                                                                                                                                                                   |
| Race (select all that apply):                                             | Caucasian: <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Asian: <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Native Hawaiian/Pacific Islander: <input type="checkbox"/> Yes <input type="checkbox"/> No | Black/African American: <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Am Indian/Alaskan Nat: <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Other: <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Hispanic or Latino Ethnicity                                              | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                                             |                                                                                                                                                                                                                                        |
| Date of Last Follow- Up:                                                  | (mm/dd/yyyy) ____ / ____ / ____                                                                                                                                                                                                      |                                                                                                                                                                                                                                        |
| Last follow-up NYHA Classification:                                       | <input type="checkbox"/> NYHA 1 <input type="checkbox"/> NYHA 2 <input type="checkbox"/> NYHA 3 <input type="checkbox"/> NYHA 4                                                                                                      |                                                                                                                                                                                                                                        |
| Mortality Status at Last Follow - Up:                                     | <input type="checkbox"/> Alive <input type="checkbox"/> Dead                                                                                                                                                                         |                                                                                                                                                                                                                                        |
| Mortality Date:                                                           | (mm/dd/yyyy) ____ / ____ / ____                                                                                                                                                                                                      |                                                                                                                                                                                                                                        |

## NONCARDIAC CONGENITAL ANATOMIC ABNORMALITIES (select all that apply)

- ☐ 5 = None
- ☐ 10 = Anal Atresia (imperforate anus)
- ☐ 20 = Congenital diaphragmatic hernia (CDH)
- ☐ 30 = Gastroschisis
- ☐ 40 = Hirschsprung's disease (Congenital aganglionic megacolon)
- ☐ 50 = Intestinal malrotation
- ☐ 60 = Omphalocele
- ☐ 70 = Tracheoesophageal fistula (TEF)

## CHROMOSOMAL ABNORMALITIES (select all that apply)

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li><input type="checkbox"/> 5 = No chromosomal abnormality identified</li> <li><input type="checkbox"/> 10 = 11p15.5</li> <li><input type="checkbox"/> 20 = 11q</li> <li><input type="checkbox"/> 30 = 12p1.21</li> <li><input type="checkbox"/> 40 = 12p12.1</li> <li><input type="checkbox"/> 50 = 12q24</li> <li><input type="checkbox"/> 60 = 15q21.1</li> <li><input type="checkbox"/> 70 = 1q42.1</li> <li><input type="checkbox"/> 80 = 20p12</li> <li><input type="checkbox"/> 90 = 22q11 deletion</li> <li><input type="checkbox"/> 100 = 2p21</li> <li><input type="checkbox"/> 110 = 3p22</li> <li><input type="checkbox"/> 120 = 45X0</li> <li><input type="checkbox"/> 130 = 47,XXY</li> <li><input type="checkbox"/> 140 = 4p</li> <li><input type="checkbox"/> 150 = 4p16</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> 160 = 5p</li> <li><input type="checkbox"/> 170 = 6p12</li> <li><input type="checkbox"/> 180 = 7q11</li> <li><input type="checkbox"/> 190 = 7q11.23</li> <li><input type="checkbox"/> 200 = 7q32</li> <li><input type="checkbox"/> 210 = 7q34</li> <li><input type="checkbox"/> 220 = 8q12</li> <li><input type="checkbox"/> 230 = Monosomy X</li> <li><input type="checkbox"/> 240 = TGFB1 or 2</li> <li><input type="checkbox"/> 250 = Trisomy 08</li> <li><input type="checkbox"/> 260 = Trisomy 09</li> <li><input type="checkbox"/> 270 = Trisomy 13</li> <li><input type="checkbox"/> 280 = Trisomy 18</li> <li><input type="checkbox"/> 290 = Trisomy 21</li> <li><input type="checkbox"/> 310 = Other chromosomal abnormality</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**SYNDROMES (select all that apply)**

- |                                                                                                                                   |                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> 5 = No syndromic abnormality identified                                                                  | <input type="checkbox"/> 250 = Klinefelter syndrome (XXY Syndrome)                                               |
| <input type="checkbox"/> 10 = Alagille syndrome (intrahepatic biliary duct agenesis)                                              | <input type="checkbox"/> 260 = LEOPARD syndrome                                                                  |
| <input type="checkbox"/> 20 = Apert syndrome                                                                                      | <input type="checkbox"/> 270 = Loeys-Dietz syndrome                                                              |
| <input type="checkbox"/> 30 = Brugada syndrome (Sudden unexplained nocturnal death syndrome) (SUNDS)                              | <input type="checkbox"/> 280 = Long QT syndrome (Ward Romano syndrome)                                           |
| <input type="checkbox"/> 40 = Cardiofaciocutaneous syndrome                                                                       | <input type="checkbox"/> 290 = Marfan syndrome                                                                   |
| <input type="checkbox"/> 50 = Carpenter syndrome                                                                                  | <input type="checkbox"/> 300 = Marfan-like syndrome                                                              |
| <input type="checkbox"/> 60 = Cat-eye syndrome                                                                                    | <input type="checkbox"/> 310 = Mucopolysaccharidosis type IH (Hurler syndrome)                                   |
| <input type="checkbox"/> 70 = CHARGE Association                                                                                  | <input type="checkbox"/> 320 = Mucopolysaccharidosis type IH/S (Hurler-Scheie syndrome)                          |
| <input type="checkbox"/> 80 = Cornelia de Lange syndrome                                                                          | <input type="checkbox"/> 330 = Mucopolysaccharidosis type II (Hunter syndrome)                                   |
| <input type="checkbox"/> 90 = Costello syndrome                                                                                   | <input type="checkbox"/> 340 = Mucopolysaccharidosis type IS (Scheie syndrome)                                   |
| <input type="checkbox"/> 100 = Cri-du-chat syndrome                                                                               | <input type="checkbox"/> 350 = Noonan syndrome                                                                   |
| <input type="checkbox"/> 110 = Deletion 10p syndrome                                                                              | <input type="checkbox"/> 360 = Patau syndrome (Trisomy 13)                                                       |
| <input type="checkbox"/> 120 = Deletion 8p syndrome                                                                               | <input type="checkbox"/> 370 = Rethore syndrome (Trisomy 9)                                                      |
| <input type="checkbox"/> 130 = DiGeorge syndrome (velocardiofacial syndrome) (conotruncal anomaly face syndrome) (22q11 deletion) | <input type="checkbox"/> 380 = Rubella                                                                           |
| <input type="checkbox"/> 140 = Down syndrome (Trisomy 21)                                                                         | <input type="checkbox"/> 390 = Rubinstein-Taybi syndrome                                                         |
| <input type="checkbox"/> 150 = Edwards syndrome (Trisomy 18)                                                                      | <input type="checkbox"/> 400 = Short QT syndrome                                                                 |
| <input type="checkbox"/> 160 = Ellis-van Creveld syndrome                                                                         | <input type="checkbox"/> 410 = Situs inversus                                                                    |
| <input type="checkbox"/> 165 = Fetal alcohol syndrome (FAS)                                                                       | <input type="checkbox"/> 420 = Smith-Lemli-Opitz syndrome                                                        |
| <input type="checkbox"/> 166 = Fetal drug exposure                                                                                | <input type="checkbox"/> 430 = Turner syndrome (45XO)                                                            |
| <input type="checkbox"/> 170 = Goldenhar syndrome                                                                                 | <input type="checkbox"/> 440 = VACTERL syndrome (VACTER/VATER/VATERR syndrome)                                   |
| <input type="checkbox"/> 180 = Heterotaxy syndrome                                                                                | <input type="checkbox"/> 450 = VACTERL-H syndrome (VATER association with hydrocephalus) (Briard-Evans syndrome) |
| <input type="checkbox"/> 190 = Heterotaxy syndrome, Asplenia syndrome                                                             | <input type="checkbox"/> 460 = Warkany syndrome (Trisomy 8)                                                      |
| <input type="checkbox"/> 200 = Heterotaxy syndrome, Polysplenia syndrome                                                          | <input type="checkbox"/> 470 = Williams syndrome (Williams-Beuren syndrome)                                      |
| <input type="checkbox"/> 210 = Holt-Oram syndrome                                                                                 | <input type="checkbox"/> 480 = Wolff-Parkinson-White syndrome (WPW syndrome)                                     |
| <input type="checkbox"/> 220 = Jacobsen syndrome                                                                                  | <input type="checkbox"/> 490 = Wolf-Hirschhorn syndrome                                                          |
| <input type="checkbox"/> 230 = Kabuki syndrome                                                                                    | <input type="checkbox"/> 510 = Other syndromic abnormality                                                       |
| <input type="checkbox"/> 240 = Kartagener syndrome (Siewert syndrome) (Primary ciliary dyskinesia)                                |                                                                                                                  |

**HOSPITALIZATION**

Hospital Name:

Hospital Zip Code:

Hospital State:

Hospital National Provider Identifier:

Payor – (Select all that apply)

Government Health Insurance: ☐ Yes ☐ No (If Yes, select all that apply: ↓)Medicare: ☐ Yes ☐ No (If Yes →) Medicare Fee For Service: ☐ Yes ☐ NoMedicaid: ☐ Yes ☐ No Military Health Care: ☐ Yes ☐ NoState-Specific Plan: ☐ Yes ☐ No Indian Health Service: ☐ Yes ☐ NoCommercial Health Insurance: ☐ Yes ☐ NoHealth Maintenance Organization: ☐ Yes ☐ NoNon-U.S. Insurance: ☐ Yes ☐ NoNone / Self: ☐ Yes ☐ No



|                                                 |              |                                   |                                               |  |  |
|-------------------------------------------------|--------------|-----------------------------------|-----------------------------------------------|--|--|
| Admission date: (mm/dd/yyyy) ____ / ____ / ____ |              |                                   | Surgery date: (mm/dd/yyyy) ____ / ____ / ____ |  |  |
| Height (Cm):                                    | Weight (Kg): | Age at time of surgery (in days): |                                               |  |  |

| PREOPERATIVE FACTORS (select all that apply)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> 10 = No preoperative factors identified<br><input type="checkbox"/> 200 = Cardio-pulmonary resuscitation<br><input type="checkbox"/> 210 = Preoperative complete AV block<br><input type="checkbox"/> 220 = Preoperative/Preprocedural mechanical circulatory support (IABP, VAD, ECMO, or CPS)<br><input type="checkbox"/> 230 = Shock, Persistent at time of surgery<br><input type="checkbox"/> 240 = Shock, Resolved at time of surgery<br><input type="checkbox"/> 250 = Diabetes mellitus, Insulin dependent<br><input type="checkbox"/> 260 = Diabetes mellitus, Non-insulin dependent<br><input type="checkbox"/> 270 = Hypothyroidism<br><input type="checkbox"/> 280 = Currently taking steroids as treatment for adrenal insufficiency<br><input type="checkbox"/> 290 = Currently taking steroids for any reason other than treatment of adrenal insufficiency<br><input type="checkbox"/> 295 = Colostomy present<br><input type="checkbox"/> 300 = Enterostomy of small intestine present<br><input type="checkbox"/> 305 = Esophagostomy present<br><input type="checkbox"/> 307 = Gastrostomy present<br><input type="checkbox"/> 310 = Hepatic dysfunction<br><input type="checkbox"/> 320 = Necrotizing entero-colitis, Treated medically<br><input type="checkbox"/> 330 = Necrotizing entero-colitis, Treated surgically | <input type="checkbox"/> 340 = Coagulation disorder, Hypercoagulable state<br><input type="checkbox"/> 350 = Coagulation disorder, Hypocoagulable state not secondary to medication (intrinsic hypocoagulable state)<br><input type="checkbox"/> 360 = Coagulation disorder, Hypocoagulable state secondary to medication<br><input type="checkbox"/> 370 = Endocarditis<br><input type="checkbox"/> 380 = Sepsis<br><input type="checkbox"/> 390 = Sepsis with positive blood culture<br><input type="checkbox"/> 400 = Preoperative neurological deficit<br><input type="checkbox"/> 410 = Seizure during lifetime<br><input type="checkbox"/> 420 = Seizure within 48 hours prior to surgery<br><input type="checkbox"/> 430 = Stroke, CVA, or Intracranial hemorrhage > Grade 2 during lifetime<br><input type="checkbox"/> 440 = Stroke, CVA, or Intracranial hemorrhage > Grade 2 within 48 hours prior to surgery<br><input type="checkbox"/> 450 = Renal dysfunction<br><input type="checkbox"/> 460 = Renal failure requiring dialysis<br><input type="checkbox"/> 470 = Mechanical ventilation to treat cardiorespiratory failure<br><input type="checkbox"/> 480 = Respiratory Syncytial Virus<br><input type="checkbox"/> 490 = Single lung<br><input type="checkbox"/> 500 = Tracheostomy present<br><input type="checkbox"/> 777 = Other preoperative factors |

| DIAGNOSIS                                                                                                 |                                     |                                                                                                             |                                                           |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Antenatal Diagnosis of Congenital Heart Disease: <input type="checkbox"/> Yes <input type="checkbox"/> No |                                     |                                                                                                             |                                                           |
|                                                                                                           | Select ALL diagnosis that apply (↓) | CIRCLE the ONE PRIMARY diagnosis for this operation                                                         | Select the ONE FUNDAMENTAL diagnosis for this patient (↓) |
| Septal Defects                                                                                            | ASD                                 | <input type="checkbox"/> 10 = PFO                                                                           | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 20 = ASD, Secundum                                                                 | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 30 = ASD, Sinus venosus                                                            | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 40 = ASD, Coronary sinus                                                           | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 50 = ASD, Common atrium (single atrium)                                            | <input type="checkbox"/>                                  |
|                                                                                                           | VSD                                 | <input type="checkbox"/> 71 = VSD, Type 1 (Subarterial) (Supracristal) (Conal septal defect) (Infundibular) | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 73 = VSD, Type 2 (Perimembranous) (Paramembranous) (Conoventricular)               | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 75 = VSD, Type 3 (Inlet) (AV canal type)                                           | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 77 = VSD, Type 4 (Muscular)                                                        | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 79 = VSD, Type: Gerbode type (LV-RA communication)                                 | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 80 = VSD, Multiple                                                                 | <input type="checkbox"/>                                  |
|                                                                                                           | AV Canal                            | <input type="checkbox"/> 100 = AVC (AVSD), Complete (CAVSD)                                                 | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 110 = AVC (AVSD), Intermediate (transitional)                                      | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 120 = AVC (AVSD), Partial (incomplete) (PAVSD) (ASD, primum)                       | <input type="checkbox"/>                                  |
|                                                                                                           | AP Window                           | <input type="checkbox"/> 140 = AP window (aortopulmonary window)                                            | <input type="checkbox"/>                                  |
|                                                                                                           |                                     | <input type="checkbox"/> 150 = Pulmonary artery origin from ascending aorta (hemitruncus)                   | <input type="checkbox"/>                                  |
|                                                                                                           | Truncus Arteriosus                  | <input type="checkbox"/> 160 = Truncus arteriosus                                                           | <input type="checkbox"/>                                  |

|                                   |                                               |                                                                                                                   |                          |
|-----------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------|
|                                   |                                               | <input type="checkbox"/> 170 = Truncal valve insufficiency                                                        | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 2010 = Truncus arteriosus + Interrupted aortic arch                                      | <input type="checkbox"/> |
| <b>Pulmonary Venous Anomalies</b> | Partial Anomalous Pulmonary Venous Connection | <input type="checkbox"/> 180 = Partial anomalous pulmonary venous connection (PAPVC)                              | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 190 = Partial anomalous pulmonary venous connection (PAPVC), scimitar                    | <input type="checkbox"/> |
|                                   | Total Anomalous Pulmonary Venous Connection   | <input type="checkbox"/> 200 = Total anomalous pulmonary venous connection (TAPVC), Type 1 (supracardiac)         | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 210 = Total anomalous pulmonary venous connection (TAPVC), Type 2 (cardiac)              | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 220 = Total anomalous pulmonary venous connection (TAPVC), Type 3 (infracardiac)         | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 230 = Total anomalous pulmonary venous connection (TAPVC), Type 4 (mixed)                | <input type="checkbox"/> |
| <b>Cor Triatriatum</b>            |                                               | <input type="checkbox"/> 250 = Cor triatriatum                                                                    | <input type="checkbox"/> |
| <b>Pulmonary Venous Stenosis</b>  |                                               | <input type="checkbox"/> 260 = Pulmonary venous stenosis                                                          | <input type="checkbox"/> |
| <b>Systemic Venous Anomalies</b>  | Anomalous Systemic Venous Connection          | <input type="checkbox"/> 270 = Systemic venous anomaly                                                            | <input type="checkbox"/> |
|                                   | Systemic venous obstruction                   | <input type="checkbox"/> 280 = Systemic venous obstruction                                                        | <input type="checkbox"/> |
| <b>Right Heart Lesions</b>        | Tetralogy of Fallot                           | <input type="checkbox"/> 290 = TOF                                                                                | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 2140 = TOF, Pulmonary stenosis                                                           | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 300 = TOF, AVC (AVSD)                                                                    | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 310 = TOF, Absent pulmonary valve                                                        | <input type="checkbox"/> |
|                                   | Pulmonary Atresia                             | <input type="checkbox"/> 320 = Pulmonary atresia                                                                  | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 330 = Pulmonary atresia, IVS                                                             | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 340 = Pulmonary atresia, VSD (Including TOF, PA)                                         | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 350 = Pulmonary atresia, VSD-MAPCA (pseudotruncus)                                       | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 360 = MAPCA(s) (major aortopulmonary collateral[s]) (without PA-VSD)                     | <input type="checkbox"/> |
|                                   | Tricuspid Valve Disease and Ebstein's Anomaly | <input type="checkbox"/> 370 = Ebstein's anomaly                                                                  | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 380 = Tricuspid regurgitation, non-Ebstein's related                                     | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 390 = Tricuspid stenosis                                                                 | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 400 = Tricuspid regurgitation and tricuspid stenosis                                     | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 410 = Tricuspid valve, Other                                                             | <input type="checkbox"/> |
|                                   | RVOT Obstruction and/or Pulmonary Stenosis    | <input type="checkbox"/> 420 = Pulmonary stenosis, Valvar                                                         | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 430 = Pulmonary artery stenosis (hypoplasia), Main (trunk)                               | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 440 = Pulmonary artery stenosis, Branch, Central (within the hilar bifurcation)          | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 450 = Pulmonary artery stenosis, Branch, Peripheral (at or beyond the hilar bifurcation) | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 470 = Pulmonary artery, Discontinuous                                                    | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 490 = Pulmonary stenosis, Subvalvar                                                      | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 500 = DCRV                                                                               | <input type="checkbox"/> |
|                                   | Pulmonary Valve Disease                       | <input type="checkbox"/> 510 = Pulmonary valve, Other                                                             | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 530 = Pulmonary insufficiency                                                            | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 540 = Pulmonary insufficiency and pulmonary stenosis                                     | <input type="checkbox"/> |
| <b>Shunt failure</b>              | Shunt failure                                 | <input type="checkbox"/> 2130 = Shunt Failure                                                                     | NA                       |
| <b>Conduit failure</b>            | Conduit failure                               | <input type="checkbox"/> 520 = Conduit failure                                                                    | <input type="checkbox"/> |
| <b>Left Heart Lesions</b>         | Aortic Valve Disease                          | <input type="checkbox"/> 550 = Aortic stenosis, Subvalvar                                                         | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 560 = Aortic stenosis, Valvar                                                            | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 570 = Aortic stenosis, Supravalvar                                                       | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 590 = Aortic valve atresia                                                               | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 600 = Aortic insufficiency                                                               | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 610 = Aortic insufficiency and aortic stenosis                                           | <input type="checkbox"/> |
|                                   |                                               | <input type="checkbox"/> 620 = Aortic valve, Other                                                                | <input type="checkbox"/> |
|                                   | Sinus of Valsalva Fistula/Aneurysm            | <input type="checkbox"/> 630 = Sinus of Valsalva aneurysm                                                         | <input type="checkbox"/> |
|                                   | LV to Aorta Tunnel                            | <input type="checkbox"/> 640 = LV to aorta tunnel                                                                 | <input type="checkbox"/> |

|                                     |                                                 |                                                                                                                        |                          |
|-------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                                     | Mitral Valve Disease                            | <input type="checkbox"/> 650 = Mitral stenosis, Supravalvar mitral ring                                                | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 660 = Mitral stenosis, Valvar                                                                 | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 670 = Mitral stenosis, Subvalvar                                                              | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 680 = Mitral stenosis, Subvalvar, Parachute                                                   | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 695 = Mitral stenosis                                                                         | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 700 = Mitral regurgitation and mitral stenosis                                                | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 710 = Mitral regurgitation                                                                    | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 720 = Mitral valve, Other                                                                     | <input type="checkbox"/> |
|                                     | Hypoplastic Left Heart Syndrome                 | <input type="checkbox"/> 730 = Hypoplastic left heart syndrome (HLHS)                                                  | <input type="checkbox"/> |
|                                     | Shone's syndrome                                | <input type="checkbox"/> 2080 = Shone's syndrome {CAN NOT BE PRIMARY DIAGNOSIS}                                        | <input type="checkbox"/> |
| Cardiomyopathy                      |                                                 | <input type="checkbox"/> 740 = Cardiomyopathy (including dilated, restrictive, and hypertrophic)                       | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 750 = Cardiomyopathy, End-stage congenital heart disease                                      | <input type="checkbox"/> |
| Pericardial Disease                 |                                                 | <input type="checkbox"/> 760 = Pericardial effusion                                                                    | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 770 = Pericarditis                                                                            | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 780 = Pericardial disease, Other                                                              | <input type="checkbox"/> |
| Single Ventricle                    |                                                 | <input type="checkbox"/> 790 = Single ventricle, DILV                                                                  | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 800 = Single ventricle, DIRV                                                                  | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 810 = Single ventricle, Mitral atresia                                                        | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 820 = Single ventricle, Tricuspid atresia                                                     | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 830 = Single ventricle, Unbalanced AV canal                                                   | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 840 = Single ventricle, Heterotaxia syndrome                                                  | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 850 = Single ventricle, Other                                                                 | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 851 = Single Ventricle + Total anomalous pulmonary venous connection (TAPVC)                  | <input type="checkbox"/> |
| Transposition of the Great Arteries | Congenitally Corrected TGA                      | <input type="checkbox"/> 870 = Congenitally corrected TGA                                                              | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 872 = Congenitally corrected TGA, IVS                                                         | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 874 = Congenitally corrected TGA, IVS-LVOTO                                                   | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 876 = Congenitally corrected TGA, VSD                                                         | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 878 = Congenitally corrected TGA, VSD-LVOTO                                                   | <input type="checkbox"/> |
|                                     | Transposition of the Great Arteries             | <input type="checkbox"/> 880 = TGA, IVS                                                                                | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 890 = TGA, IVS-LVOTO                                                                          | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 900 = TGA, VSD                                                                                | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 910 = TGA, VSD-LVOTO                                                                          | <input type="checkbox"/> |
|                                     |                                                 |                                                                                                                        |                          |
| DORV                                |                                                 | <input type="checkbox"/> 930 = DORV, VSD type                                                                          | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 940 = DORV, TOF type                                                                          | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 950 = DORV, TGA type                                                                          | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 960 = DORV, Remote VSD (uncommitted VSD)                                                      | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 2030 = DORV + AVSD (AV Canal)                                                                 | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 975 = DORV, IVS                                                                               | <input type="checkbox"/> |
| DOLV                                |                                                 | <input type="checkbox"/> 980 = DOLV                                                                                    | <input type="checkbox"/> |
| Thoracic Arteries and Veins         | Coarctation of Aorta and Aortic arch hypoplasia | <input type="checkbox"/> 990 = Coarctation of aorta                                                                    | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 1000 = Aortic arch hypoplasia                                                                 | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 92 = VSD + Aortic arch hypoplasia                                                             | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 94 = VSD + Coarctation of aorta                                                               | <input type="checkbox"/> |
|                                     | Coronary Artery Anomalies                       | <input type="checkbox"/> 1010 = Coronary artery anomaly, Anomalous aortic origin of coronary artery from aorta (AAOCA) | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 1020 = Coronary artery anomaly, Anomalous pulmonary origin (includes ALCAPA)                  | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 1030 = Coronary artery anomaly, Fistula                                                       | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 1040 = Coronary artery anomaly, Aneurysm                                                      | <input type="checkbox"/> |
|                                     |                                                 | <input type="checkbox"/> 1050 = Coronary artery anomaly, Other                                                         | <input type="checkbox"/> |
|                                     | Interrupted Arch                                | <input type="checkbox"/> 1070 = Interrupted aortic arch                                                                | <input type="checkbox"/> |

|                                  |                             |                                                                                             |                          |
|----------------------------------|-----------------------------|---------------------------------------------------------------------------------------------|--------------------------|
|                                  |                             | <input type="checkbox"/> 2020 = Interrupted aortic arch + VSD                               | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 2000 = Interrupted aortic arch + AP window (aortopulmonary window) | <input type="checkbox"/> |
|                                  | Patent Ductus Arteriosus    | <input type="checkbox"/> 1080 = Patent ductus arteriosus                                    | <input type="checkbox"/> |
|                                  | Vascular rings and Slings   | <input type="checkbox"/> 1090 = Vascular ring                                               | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1100 = Pulmonary artery sling                                      | <input type="checkbox"/> |
|                                  | Aortic Aneurysm             | <input type="checkbox"/> 1110 = Aortic aneurysm (including pseudoaneurysm)                  | <input type="checkbox"/> |
| Thoracic and Mediastinal Disease | Aortic Dissection           | <input type="checkbox"/> 1120 = Aortic dissection                                           | <input type="checkbox"/> |
|                                  | Lung Disease                | <input type="checkbox"/> 1130 = Lung disease, Benign                                        | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1140 = Lung disease, Malignant                                     | <input type="checkbox"/> |
|                                  | Pectus Excavatum, Carinatum | <input type="checkbox"/> 1150 = Pectus                                                      | <input type="checkbox"/> |
|                                  | Tracheal Stenosis           | <input type="checkbox"/> 1160 = Tracheal stenosis                                           | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1170 = Airway disease                                              | <input type="checkbox"/> |
|                                  | Pleural Disease             | <input type="checkbox"/> 1430 = Pleural disease, Benign                                     | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1440 = Pleural disease, Malignant                                  | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1450 = Pneumothorax                                                | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1460 = Pleural effusion                                            | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1470 = Chylothorax                                                 | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1480 = Empyema                                                     | <input type="checkbox"/> |
|                                  | Esophageal Disease          | <input type="checkbox"/> 1490 = Esophageal disease, Benign                                  | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1500 = Esophageal disease, Malignant                               | <input type="checkbox"/> |
|                                  | Mediastinal Disease         | <input type="checkbox"/> 1505 = Mediastinal disease                                         | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1510 = Mediastinal disease, Benign                                 | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1520 = Mediastinal disease, Malignant                              | <input type="checkbox"/> |
|                                  | Diaphragmatic Disease       | <input type="checkbox"/> 1540 = Diaphragm paralysis                                         | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1550 = Diaphragm disease, Other                                    | <input type="checkbox"/> |
| Electrophysiological             |                             | <input type="checkbox"/> 1180 = Arrhythmia                                                  | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 2040 = Arrhythmia, Atrial                                          | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 2050 = Arrhythmia, Junctional                                      | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 2060 = Arrhythmia, Ventricular                                     | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1185 = Arrhythmia, Heart block                                     | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1190 = Arrhythmia, Heart block, Acquired                           | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1200 = Arrhythmia, Heart block, Congenital                         | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1220 = Arrhythmia, Pacemaker, Indication for replacement           | <input type="checkbox"/> |
| Miscellaneous, Other             |                             | <input type="checkbox"/> 1230 = Atrial Isomerism, Left {CAN NOT BE PRIMARY DIAGNOSIS}       | NA                       |
|                                  |                             | <input type="checkbox"/> 1240 = Atrial Isomerism, Right {CAN NOT BE PRIMARY DIAGNOSIS}      | NA                       |
|                                  |                             | <input type="checkbox"/> 2090 = Dextrocardia {CAN NOT BE PRIMARY DIAGNOSIS}                 | NA                       |
|                                  |                             | <input type="checkbox"/> 2100 = Levocardia {CAN NOT BE PRIMARY DIAGNOSIS}                   | NA                       |
|                                  |                             | <input type="checkbox"/> 2110 = Mesocardia {CAN NOT BE PRIMARY DIAGNOSIS}                   | NA                       |
|                                  |                             | <input type="checkbox"/> 2120 = Situs inversus {CAN NOT BE PRIMARY DIAGNOSIS}               | NA                       |
|                                  |                             | <input type="checkbox"/> 1250 = Aneurysm, Ventricular, Right (including pseudoaneurysm)     | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1260 = Aneurysm, Ventricular, Left (including pseudoaneurysm)      | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1270 = Aneurysm, Pulmonary artery                                  | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1280 = Aneurysm, Other                                             | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1290 = Hypoplastic RV                                              | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1300 = Hypoplastic LV                                              | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 2070 = Postoperative bleeding                                      | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1310 = Mediastinitis                                               | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1320 = Endocarditis                                                | <input type="checkbox"/> |
|                                  |                             | <input type="checkbox"/> 1325 = Rheumatic heart disease {CAN NOT BE PRIMARY DIAGNOSIS}      | NA                       |
|                                  |                             | <input type="checkbox"/> 1330 = Prosthetic valve failure                                    | <input type="checkbox"/> |

|                          |                                                               |                          |
|--------------------------|---------------------------------------------------------------|--------------------------|
| <input type="checkbox"/> | 1340 = Myocardial infarction                                  | <input type="checkbox"/> |
| <input type="checkbox"/> | 1350 = Cardiac tumor                                          | <input type="checkbox"/> |
| <input type="checkbox"/> | 1360 = Pulmonary AV fistula                                   | <input type="checkbox"/> |
| <input type="checkbox"/> | 1370 = Pulmonary embolism                                     | <input type="checkbox"/> |
| <input type="checkbox"/> | 1385 = Pulmonary vascular obstructive disease                 | <input type="checkbox"/> |
| <input type="checkbox"/> | 1390 = Pulmonary vascular obstructive disease (Eisenmenger's) | <input type="checkbox"/> |
| <input type="checkbox"/> | 1400 = Primary pulmonary hypertension                         | <input type="checkbox"/> |
| <input type="checkbox"/> | 1410 = Persistent fetal circulation                           | <input type="checkbox"/> |
| <input type="checkbox"/> | 1420 = Meconium aspiration                                    | <input type="checkbox"/> |
| <input type="checkbox"/> | 1560 = Cardiac, Other                                         | <input type="checkbox"/> |
| <input type="checkbox"/> | 1570 = Thoracic and/or mediastinal, Other                     | <input type="checkbox"/> |
| <input type="checkbox"/> | 1580 = Peripheral vascular, Other                             | <input type="checkbox"/> |
| <input type="checkbox"/> | 7000 = Normal heart                                           | <input type="checkbox"/> |
| <input type="checkbox"/> | 7777 = Miscellaneous, Other                                   | <input type="checkbox"/> |

**STATUS POST (No "Status post – diagnoses" can be a primary diagnosis or fundamental diagnosis)**

|                |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Septal Defects | ASD                | <input type="checkbox"/> 4010 = Status post - PFO, Primary closure<br><input type="checkbox"/> 4020 = Status post - ASD repair, Primary closure<br><input type="checkbox"/> 4030 = Status post - ASD repair, Patch<br><input type="checkbox"/> 4040 = Status post - ASD repair, Device<br><input type="checkbox"/> 6110 = Status post - ASD repair, Patch + PAPVC repair<br><input type="checkbox"/> 4050 = Status post - ASD, Common atrium (single atrium), Septation<br><input type="checkbox"/> 4060 = Status post - ASD creation/enlargement<br><input type="checkbox"/> 4070 = Status post - ASD partial closure<br><input type="checkbox"/> 4080 = Status post - Atrial septal fenestration<br><input type="checkbox"/> 4085 = Status post - Atrial fenestration closure |
|                | VSD                | <input type="checkbox"/> 4100 = Status post - VSD repair, Primary closure<br><input type="checkbox"/> 4110 = Status post - VSD repair, Patch<br><input type="checkbox"/> 4120 = Status post - VSD repair, Device<br><input type="checkbox"/> 4130 = Status post - VSD, Multiple, Repair<br><input type="checkbox"/> 4140 = Status post - VSD creation/enlargement<br><input type="checkbox"/> 4150 = Status post - Ventricular septal fenestration                                                                                                                                                                                                                                                                                                                              |
|                | AV Canal           | <input type="checkbox"/> 4170 = Status post - AVC (AVSD) repair, Complete (CAVSD)<br><input type="checkbox"/> 4180 = Status post - AVC (AVSD) repair, Intermediate (Transitional)<br><input type="checkbox"/> 4190 = Status post - AVC (AVSD) repair, Partial (Incomplete) (PAVSD)<br><input type="checkbox"/> 6300 = Status post - Valvuloplasty, Common atrioventricular valve<br><input type="checkbox"/> 6250 = Status post - Valvuloplasty converted to valve replacement in the same operation, Common atrioventricular valve<br><input type="checkbox"/> 6230 = Status post - Valve replacement, Common atrioventricular valve                                                                                                                                           |
|                | AP Window          | <input type="checkbox"/> 4210 = Status post - AP window repair<br><input type="checkbox"/> 4220 = Status post - Pulmonary artery origin from ascending aorta (hemitruncus) repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                | Truncus Arteriosus | <input type="checkbox"/> 4230 = Status post - Truncus arteriosus repair<br><input type="checkbox"/> 4240 = Status post - Valvuloplasty, Truncal valve<br><input type="checkbox"/> 6290 = Status post - Valvuloplasty converted to valve replacement in the same operation, Truncal valve<br><input type="checkbox"/> 4250 = Status post - Valve replacement, Truncal valve<br><input type="checkbox"/> 6220 = Status post - Truncus + Interrupted aortic arch repair (IAA) repair                                                                                                                                                                                                                                                                                               |

**Pulmonary Venous Anomalies**

Partial Anomalous Pulmonary Venous Connection

|                          |                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | 4260 = Status post - PAPVC repair                                                                                                                   |
| <input type="checkbox"/> | 4270 = Status post - PAPVC, Scimitar, Repair                                                                                                        |
| <input type="checkbox"/> | 6120 = Status post - PAPVC repair, Baffle redirection to left atrium with systemic vein translocation (Warden) (SVC sewn to right atrial appendage) |

|                                  |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | Total Anomalous Pulmonary Venous Connection | <input type="checkbox"/> 4280 = Status post - TAPVC repair<br><input type="checkbox"/> 6200 = Status post - TAPVC repair + Shunt - systemic-to-pulmonary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Cor Triatriatum</b>           |                                             | <input type="checkbox"/> 4290 = Status post - Cor triatriatum repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Pulmonary Venous Stenosis</b> |                                             | <input type="checkbox"/> 4300 = Status post - Pulmonary venous stenosis repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Systemic Venous Anomalies</b> | Anomalous Systemic Venous Connection        | <input type="checkbox"/> 4310 = Status post - Atrial baffle procedure (non-Mustard, non-Senning)<br><input type="checkbox"/> 4330 = Status post - Anomalous systemic venous connection repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                  | Systemic venous obstruction                 | <input type="checkbox"/> 4340 = Status post - Systemic venous stenosis repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Right Heart Lesions</b>       | Tetralogy of Fallot                         | <input type="checkbox"/> 4350 = Status post - TOF repair, No ventriculotomy<br><input type="checkbox"/> 4360 = Status post - TOF repair, Ventriculotomy, Nontransanular patch<br><input type="checkbox"/> 4370 = Status post - TOF repair, Ventriculotomy, Transanular patch<br><input type="checkbox"/> 4380 = Status post - TOF repair, RV-PA conduit<br><input type="checkbox"/> 4390 = Status post - TOF - AVC (AVSD) repair<br><input type="checkbox"/> 4400 = Status post - TOF - Absent pulmonary valve repair                                                                                                                                        |
|                                  |                                             | <input type="checkbox"/> 4420 = Status post - Pulmonary atresia - VSD (including TOF, PA) repair<br><input type="checkbox"/> 4430 = Status post - Pulmonary atresia - VSD - MAPCA (pseudotruncus) repair<br><input type="checkbox"/> 4440 = Status post - Unifocalization MAPCA(s)<br><input type="checkbox"/> 4450 = Status post - Occlusion MAPCA(s)                                                                                                                                                                                                                                                                                                       |
|                                  |                                             | <input type="checkbox"/> 4460 = Status post - Valvuloplasty, Tricuspid<br><input type="checkbox"/> 6280 = Status post - Valvuloplasty converted to valve replacement in the same operation, Tricuspid<br><input type="checkbox"/> 4465 = Status post - Ebstein's repair<br><input type="checkbox"/> 4470 = Status post - Valve replacement, Tricuspid (TVR)<br><input type="checkbox"/> 4480 = Status post - Valve closure, Tricuspid (exclusion, univentricular approach)<br><input type="checkbox"/> 4490 = Status post - Valve excision, Tricuspid (without replacement)<br><input type="checkbox"/> 4500 = Status post - Valve surgery, Other, Tricuspid |
|                                  |                                             | <input type="checkbox"/> 4510 = Status post - RVOT procedure<br><input type="checkbox"/> 4520 = Status post - 1 1/2 ventricular repair<br><input type="checkbox"/> 4530 = Status post - PA, reconstruction (plasty), Main (trunk)<br><input type="checkbox"/> 4540 = Status post - PA, reconstruction (plasty), Branch, Central (within the hilar bifurcation)<br><input type="checkbox"/> 4550 = Status post - PA, reconstruction (plasty), Branch, Peripheral (at or beyond the hilar bifurcation)<br><input type="checkbox"/> 4570 = Status post - DCRV repair                                                                                            |
|                                  |                                             | <input type="checkbox"/> 4590 = Status post - Valvuloplasty, Pulmonic<br><input type="checkbox"/> 6270 = Status post - Valvuloplasty converted to valve replacement in the same operation, Pulmonic<br><input type="checkbox"/> 4600 = Status post - Valve replacement, Pulmonic (PVR)<br><input type="checkbox"/> 4630 = Status post - Valve excision, Pulmonary (without replacement)<br><input type="checkbox"/> 4640 = Status post - Valve closure, Semilunar<br><input type="checkbox"/> 4650 = Status post - Valve surgery, Other, Pulmonic                                                                                                            |
|                                  |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Conduit operations</b>        | Conduit operations                          | <input type="checkbox"/> 4610 = Status post - Conduit placement, RV to PA<br><input type="checkbox"/> 4620 = Status post - Conduit placement, LV to PA<br><input type="checkbox"/> 5774 = Status post - Conduit placement, Ventricle to aorta<br><input type="checkbox"/> 5772 = Status post - Conduit placement, Other                                                                                                                                                                                                                                                                                                                                      |
|                                  | Conduit Stenosis / Insufficiency            | <input type="checkbox"/> 4580 = Status post - Conduit reoperation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Left Heart Lesions</b>        | Aortic Valve Disease                        | <input type="checkbox"/> 4660 = Status post - Valvuloplasty, Aortic<br><input type="checkbox"/> 6240 = Status post - Valvuloplasty converted to valve replacement in the same operation, Aortic<br><input type="checkbox"/> 6310 = Status post - Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross procedure<br><input type="checkbox"/> 6320 = Status post - Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross-Konno procedure<br><input type="checkbox"/> 4670 = Status post - Valve replacement, Aortic (AVR)                                                                   |

|                            |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            |                            | <input type="checkbox"/> 4680 = Status post - Valve replacement, Aortic (AVR), Mechanical<br><input type="checkbox"/> 4690 = Status post - Valve replacement, Aortic (AVR), Bioprosthetic<br><input type="checkbox"/> 4700 = Status post - Valve replacement, Aortic (AVR), Homograft<br><input type="checkbox"/> 4715 = Status post - Aortic root replacement, Bioprosthetic<br><input type="checkbox"/> 4720 = Status post - Aortic root replacement, Mechanical<br><input type="checkbox"/> 4730 = Status post - Aortic root replacement, Homograft<br><input type="checkbox"/> 4735 = Status post - Aortic root replacement, Valve sparing<br><input type="checkbox"/> 4740 = Status post - Ross procedure<br><input type="checkbox"/> 4750 = Status post - Konno procedure<br><input type="checkbox"/> 4760 = Status post - Ross-Konno procedure<br><input type="checkbox"/> 4770 = Status post - Other annular enlargement procedure<br><input type="checkbox"/> 4780 = Status post - Aortic stenosis, Subvalvar, Repair<br><input type="checkbox"/> 6100 = Status post - Aortic stenosis, Subvalvar, Repair, With myectomy for IHSS<br><input type="checkbox"/> 4790 = Status post - Aortic stenosis, Supravalvar, Repair<br><input type="checkbox"/> 4800 = Status post - Valve surgery, Other, Aortic |
|                            | Sinus of Valsalva Aneurysm | <input type="checkbox"/> 4810 = Status post - Sinus of Valsalva, Aneurysm repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                            | LV to Aorta Tunnel         | <input type="checkbox"/> 4820 = Status post - LV to aorta tunnel repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                            | Mitral Valve Disease       | <input type="checkbox"/> 4830 = Status post - Valvuloplasty, Mitral<br><input type="checkbox"/> 6260 = Status post - Valvuloplasty converted to valve replacement in the same operation, Mitral<br><input type="checkbox"/> 4840 = Status post - Mitral stenosis, Supravalvar mitral ring repair<br><input type="checkbox"/> 4850 = Status post - Valve replacement, Mitral (MVR)<br><input type="checkbox"/> 4860 = Status post - Valve surgery, Other, Mitral                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                            | Hypoplastic Left Heart     | <input type="checkbox"/> 4870 = Status post - Norwood procedure<br><input type="checkbox"/> 4880 = Status post - HLHS biventricular repair<br><input type="checkbox"/> 6160 = Status post - Hybrid Approach "Stage 1", Application of RPA & LPA bands<br><input type="checkbox"/> 6170 = Status post - Hybrid Approach "Stage 1", Stent placement in arterial duct (PDA)<br><input type="checkbox"/> 6180 = Status post - Hybrid Approach "Stage 1", Stent placement in arterial duct (PDA) + application of RPA & LPA bands<br><input type="checkbox"/> 6140 = Status post - Hybrid approach "Stage 2", Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Aortic arch repair (Norwood [Stage 1] + Superior Cavopulmonary anastomosis(es) + PA Debanding)<br><input type="checkbox"/> 6150 = Status post - Hybrid approach "Stage 2", Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Without aortic arch repair                                                                                                                                                                                                                                                                                                                     |
| <b>Cardiomyopathy</b>      |                            | <input type="checkbox"/> 1590 = Status post - Transplant, Heart<br><input type="checkbox"/> 1610 = Status post - Transplant, Heart and lung<br><input type="checkbox"/> 4910 = Status post - Partial left ventriculectomy (LV volume reduction surgery) (Batista)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Pericardial Disease</b> |                            | <input type="checkbox"/> 4920 = Status post - Pericardial drainage procedure<br><input type="checkbox"/> 4930 = Status post - Pericardiectomy<br><input type="checkbox"/> 4940 = Status post - Pericardial procedure, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Single Ventricle</b>    |                            | <input type="checkbox"/> 4950 = Status post - Fontan, Atrio-pulmonary connection<br><input type="checkbox"/> 4960 = Status post - Fontan, Atrio-ventricular connection<br><input type="checkbox"/> 4970 = Status post - Fontan, TCPC, Lateral tunnel, Fenestrated<br><input type="checkbox"/> 4980 = Status post - Fontan, TCPC, Lateral tunnel, Nonfenestrated<br><input type="checkbox"/> 5000 = Status post - Fontan, TCPC, External conduit, Fenestrated<br><input type="checkbox"/> 5010 = Status post - Fontan, TCPC, External conduit, Nonfenestrated<br><input type="checkbox"/> 5025 = Status post - Fontan revision or conversion (Re-do Fontan)<br><input type="checkbox"/> 5030 = Status post - Fontan, Other<br><input type="checkbox"/> 6340 = Status post - Fontan + Atrioventricular valvuloplasty<br><input type="checkbox"/> 5035 = Status post - Ventricular septation                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                            |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transposition of the Great Arteries</b> | Congenitally Corrected TGA                      | <input type="checkbox"/> 5050 = Status post - Congenitally corrected TGA repair, Atrial switch and ASO (double switch)<br><input type="checkbox"/> 5060 = Status post - Congenitally corrected TGA repair, Atrial switch and Rastelli<br><input type="checkbox"/> 5070 = Status post - Congenitally corrected TGA repair, VSD closure<br><input type="checkbox"/> 5080 = Status post - Congenitally corrected TGA repair, VSD closure and LV to PA conduit<br><input type="checkbox"/> 5090 = Status post - Congenitally corrected TGA repair, Other                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                            | Transposition of the Great Arteries             | <input type="checkbox"/> 5110 = Status post - Arterial switch operation (ASO)<br><input type="checkbox"/> 5120 = Status post - Arterial switch operation (ASO) and VSD repair<br><input type="checkbox"/> 5123 = Status post - Arterial switch procedure + Aortic arch repair<br><input type="checkbox"/> 5125 = Status post - Arterial switch procedure and VSD repair + Aortic arch repair<br><input type="checkbox"/> 5130 = Status post - Senning<br><input type="checkbox"/> 5140 = Status post - Mustard<br><input type="checkbox"/> 5145 = Status post - Atrial baffle procedure, Mustard or Senning revision<br><input type="checkbox"/> 5150 = Status post - Rastelli<br><input type="checkbox"/> 5160 = Status post - REV<br><input type="checkbox"/> 6190 = Status post - Aortic root translocation over left ventricle (Including Nikaidoh procedure)<br><input type="checkbox"/> 6210 = Status post - TGA, Other procedures (Kawashima, LV-PA conduit, other) |
| <b>DORV</b>                                |                                                 | <input type="checkbox"/> 5180 = Status post - DORV, Intraventricular tunnel repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>DOLV</b>                                |                                                 | <input type="checkbox"/> 5200 = Status post - DOLV repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Thoracic Arteries and Veins</b>         | Coarctation of Aorta and Aortic arch hypoplasia | <input type="checkbox"/> 5210 = Status post - Coarctation repair, End to end<br><input type="checkbox"/> 5220 = Status post - Coarctation repair, End to end, Extended<br><input type="checkbox"/> 5230 = Status post - Coarctation repair, Subclavian flap<br><input type="checkbox"/> 5240 = Status post - Coarctation repair, Patch aortoplasty<br><input type="checkbox"/> 5250 = Status post - Coarctation repair, Interposition graft<br><input type="checkbox"/> 5260 = Status post - Coarctation repair, Other<br><input type="checkbox"/> 5275 = Status post - Coarctation repair + VSD repair<br><input type="checkbox"/> 5280 = Status post - Aortic arch repair<br><input type="checkbox"/> 5285 = Status post - Aortic arch repair + VSD repair                                                                                                                                                                                                               |
|                                            | Coronary Artery Anomalies                       | <input type="checkbox"/> 5290 = Status post - Coronary artery fistula ligation<br><input type="checkbox"/> 5291 = Status post - Anomalous origin of coronary artery from pulmonary artery repair<br><input type="checkbox"/> 5300 = Status post - Coronary artery bypass<br><input type="checkbox"/> 5305 = Status post - Anomalous aortic origin of coronary artery from aorta (AAOCA) repair<br><input type="checkbox"/> 5310 = Status post - Coronary artery procedure, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                            | Interrupted Arch                                | <input type="checkbox"/> 5320 = Status post - Interrupted aortic arch repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                            | Patent Ductus Arteriosus                        | <input type="checkbox"/> 5330 = Status post - PDA closure, Surgical<br><input type="checkbox"/> 5340 = PDA closure, Device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                            | Vascular Rings and Slings                       | <input type="checkbox"/> 5360 = Status post - Vascular ring repair<br><input type="checkbox"/> 5365 = Status post - Aortopexy<br><input type="checkbox"/> 5370 = Status post - Pulmonary artery sling repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                            | Aortic Aneurysm                                 | <input type="checkbox"/> 5380 = Status post - Aortic aneurysm repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                            | Aortic Dissection                               | <input type="checkbox"/> 5390 = Status post - Aortic dissection repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                            |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Thoracic and Mediastinal Disease</b>    | Lung Disease                                    | <input type="checkbox"/> 5400 = Status post - Lung biopsy<br><input type="checkbox"/> 1600 = Status post - Transplant, lung(s)<br><input type="checkbox"/> 5420 = Status post - Lung procedure, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                            | Pectus Excavatum, Carinatum                     | <input type="checkbox"/> 5430 = Status post - Pectus repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                            | Tracheal Stenosis                               | <input type="checkbox"/> 5440 = Status post - Tracheal procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Electrophysiological</b>                |                                                 | <input type="checkbox"/> 5450 = Status post - Pacemaker implantation, Permanent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                            |                                                 | <input type="checkbox"/> 5460 = Status post - Pacemaker procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                            |                                                 | <input type="checkbox"/> 6350 = Status post - Explantation of pacing system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|                                             | <input type="checkbox"/> 5470 = Status post - ICD (AICD) implantation<br><input type="checkbox"/> 5480 = Status post - ICD (AICD) ([automatic] implantable cardioverter defibrillator) procedure<br><input type="checkbox"/> 5490 = Status post - Arrhythmia surgery - atrial, Surgical Ablation<br><input type="checkbox"/> 5500 = Status post - Arrhythmia surgery - ventricular, Surgical Ablation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Interventional Cardiology Procedures</b> | <input type="checkbox"/> 6500 = Status post - Cardiovascular catheterization procedure, Diagnostic<br><input type="checkbox"/> 6520 = Status post - Cardiovascular catheterization procedure, Diagnostic, Angiographic data obtained<br><input type="checkbox"/> 6550 = Status post - Cardiovascular catheterization procedure, Diagnostic, Electrophysiology alteration<br><input type="checkbox"/> 6540 = Status post - Cardiovascular catheterization procedure, Diagnostic, Hemodynamic alteration<br><input type="checkbox"/> 6510 = Status post - Cardiovascular catheterization procedure, Diagnostic, Hemodynamic data obtained<br><input type="checkbox"/> 6530 = Status post - Cardiovascular catheterization procedure, Diagnostic, Transluminal test occlusion<br><input type="checkbox"/> 6410 = Status post - Cardiovascular catheterization procedure, Therapeutic<br><input type="checkbox"/> 6670 = Status post - Cardiovascular catheterization procedure, Therapeutic, Adjunctive therapy<br><input type="checkbox"/> 6570 = Status post - Cardiovascular catheterization procedure, Therapeutic, Balloon dilation<br><input type="checkbox"/> 6590 = Status post - Cardiovascular catheterization procedure, Therapeutic, Balloon valvotomy<br><input type="checkbox"/> 6600 = Status post - Cardiovascular catheterization procedure, Therapeutic, Coil implantation<br><input type="checkbox"/> 6610 = Status post - Cardiovascular catheterization procedure, Therapeutic, Device implantation<br><input type="checkbox"/> 6640 = Status post - Cardiovascular catheterization procedure, Therapeutic, Perforation (establishing interchamber and/or intervessel communication)<br><input type="checkbox"/> 6580 = Status post - Cardiovascular catheterization procedure, Therapeutic, Septostomy<br><input type="checkbox"/> 6620 = Status post - Cardiovascular catheterization procedure, Therapeutic, Stent insertion<br><input type="checkbox"/> 6630 = Status post - Cardiovascular catheterization procedure, Therapeutic, Stent re-dilation<br><input type="checkbox"/> 6650 = Status post - Cardiovascular catheterization procedure, Therapeutic, Transcatheter Fontan completion<br><input type="checkbox"/> 6660 = Status post - Cardiovascular catheterization procedure, Therapeutic, Transcatheter implantation of valve<br><input type="checkbox"/> 6680 = Status post - Cardiovascular electrophysiological catheterization procedure<br><input type="checkbox"/> 6690 = Status post - Cardiovascular electrophysiological catheterization procedure, Therapeutic ablation |
| <b>Palliative Procedures</b>                | <input type="checkbox"/> 5590 = Status post - Shunt, Systemic to pulmonary, Modified Blalock-Taussig Shunt (MBTS)<br><input type="checkbox"/> 5600 = Status post - Shunt, Systemic to pulmonary, Central (from aorta or to main pulmonary artery)<br><input type="checkbox"/> 5610 = Status post - Shunt, Systemic to pulmonary, Other<br><input type="checkbox"/> 5630 = Status post - Shunt, Ligation and takedown<br><input type="checkbox"/> 6095 = Status post - Shunt, Reoperation<br><input type="checkbox"/> 5640 = Status post - PA banding (PAB)<br><input type="checkbox"/> 5650 = Status post - PA debanding<br><input type="checkbox"/> 5660 = Status post - Damus-Kaye-Stansel procedure (DKS) (creation of AP anastomosis without arch reconstruction)<br><input type="checkbox"/> 5670 = Status post - Bidirectional cavopulmonary anastomosis (BDCPA) (bidirectional Glenn)<br><input type="checkbox"/> 5680 = Status post - Glenn (unidirectional cavopulmonary anastomosis) (unidirectional Glenn)<br><input type="checkbox"/> 5690 = Status post - Bilateral bidirectional cavopulmonary anastomosis (BBDCPA) (bilateral bidirectional Glenn)<br><input type="checkbox"/> 5700 = Status post - HemiFontan<br><input type="checkbox"/> 6330 = Status post - Superior cavopulmonary anastomosis(es) (Glenn or HemiFontan) + Atrioventricular valvuloplasty<br><input type="checkbox"/> 6130 = Status post - Superior Cavopulmonary anastomosis(es) + PA reconstruction<br><input type="checkbox"/> 5710 = Status post - Palliation, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Mechanical Support</b>                   | <input type="checkbox"/> 6360 = Status post - ECMO cannulation<br><input type="checkbox"/> 6370 = Status post - ECMO decannulation<br><input type="checkbox"/> 5910 = Status post - ECMO procedure<br><input type="checkbox"/> 5900 = Status post - Intraaortic balloon pump (IABP) insertion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|---------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 |  | <input type="checkbox"/> 5920 = Status post - Right/left heart assist device procedure<br><input type="checkbox"/> 6390 = Status post - VAD explantation<br><input type="checkbox"/> 6380 = Status post - VAD implantation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Anesthetic procedures</b>    |  | <input type="checkbox"/> 6420 = Status post - Echocardiography procedure, Sedated transesophageal echocardiogram<br><input type="checkbox"/> 6430 = Status post - Echocardiography procedure, Sedated transthoracic echocardiogram<br><input type="checkbox"/> 6435 = Status post - Non-cardiovascular, Non-thoracic procedure on cardiac patient with cardiac anesthesia<br><input type="checkbox"/> 6440 = Status post - Radiology procedure on cardiac patient, Cardiac Computerized Axial Tomography (CT Scan)<br><input type="checkbox"/> 6450 = Status post - Radiology procedure on cardiac patient, Cardiac Magnetic Resonance Imaging (MRI)<br><input type="checkbox"/> 6460 = Status post - Radiology procedure on cardiac patient, Diagnostic radiology<br><input type="checkbox"/> 6470 = Status post - Radiology procedure on cardiac patient, Non-Cardiac Computerized Tomography (CT) on cardiac patient<br><input type="checkbox"/> 6480 = Status post - Radiology procedure on cardiac patient, Non-cardiac Magnetic Resonance Imaging (MRI) on cardiac patient<br><input type="checkbox"/> 6490 = Status post - Interventional radiology procedure on cardiac patient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Miscellaneous Procedures</b> |  | <input type="checkbox"/> 5720 = Status post - Aneurysm, Ventricular, Right, Repair<br><input type="checkbox"/> 5730 = Status post - Aneurysm, Ventricular, Left, Repair<br><input type="checkbox"/> 5740 = Status post - Aneurysm, Pulmonary artery, Repair<br><input type="checkbox"/> 5760 = Status post - Cardiac tumor resection<br><input type="checkbox"/> 5780 = Status post - Pulmonary AV fistula repair/occlusion<br><input type="checkbox"/> 5790 = Status post - Ligation, Pulmonary artery<br><input type="checkbox"/> 5802 = Status post - Pulmonary embolectomy, Acute pulmonary embolus<br><input type="checkbox"/> 5804 = Status post - Pulmonary embolectomy, Chronic pulmonary embolus<br><input type="checkbox"/> 5810 = Status post - Pleural drainage procedure<br><input type="checkbox"/> 5820 = Status post - Pleural procedure, Other<br><input type="checkbox"/> 5830 = Status post - Ligation, Thoracic duct<br><input type="checkbox"/> 5840 = Status post - Decortication<br><input type="checkbox"/> 5850 = Status post - Esophageal procedure<br><input type="checkbox"/> 5860 = Status post - Mediastinal procedure<br><input type="checkbox"/> 5870 = Status post - Bronchoscopy<br><input type="checkbox"/> 5880 = Status post - Diaphragm plication<br><input type="checkbox"/> 5890 = Status post - Diaphragm procedure, Other<br><input type="checkbox"/> 5930 = Status post - VATS (video-assisted thoracoscopic surgery)<br><input type="checkbox"/> 5940 = Status post - Minimally invasive procedure<br><input type="checkbox"/> 5950 = Status post - Bypass for noncardiac lesion<br><input type="checkbox"/> 5960 = Status post - Delayed sternal closure<br><input type="checkbox"/> 5970 = Status post - Mediastinal exploration<br><input type="checkbox"/> 5980 = Status post - Sternotomy wound drainage<br><input type="checkbox"/> 5990 = Status post - Thoracotomy, Other<br><input type="checkbox"/> 6000 = Status post - Cardiotomy, Other<br><input type="checkbox"/> 6010 = Status post - Cardiac procedure, Other<br><input type="checkbox"/> 6020 = Status post - Thoracic and/or mediastinal procedure, Other<br><input type="checkbox"/> 6030 = Status post - Peripheral vascular procedure, Other<br><input type="checkbox"/> 6040 = Status post - Miscellaneous procedure, Other<br><input type="checkbox"/> 6050 = Status post - Organ procurement<br><input type="checkbox"/> 11777 = Status post - Other procedure |

## PROCEDURES

Select ALL procedures that apply. (↓)     Circle the ONE PRIMARY procedure for this operation.

|                       |     |                                                                                                                                                                    |
|-----------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Septal Defects</b> | ASD | <input type="checkbox"/> 10 = PFO, Primary closure<br><input type="checkbox"/> 20 = ASD repair, Primary closure<br><input type="checkbox"/> 30 = ASD repair, Patch |
|-----------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                   |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   |                                               | <input type="checkbox"/> 40 = ASD repair, Device<br><input type="checkbox"/> 2110 = ASD repair, Patch + PAPVC repair<br><input type="checkbox"/> 50 = ASD, Common atrium (single atrium), Septation<br><input type="checkbox"/> 60 = ASD creation/enlargement<br><input type="checkbox"/> 70 = ASD partial closure<br><input type="checkbox"/> 80 = Atrial septal fenestration<br><input type="checkbox"/> 85 = Atrial fenestration closure                                                                                                    |
|                                   | VSD                                           | <input type="checkbox"/> 100 = VSD repair, Primary closure<br><input type="checkbox"/> 110 = VSD repair, Patch<br><input type="checkbox"/> 120 = VSD repair, Device<br><input type="checkbox"/> 130 = VSD, Multiple, Repair<br><input type="checkbox"/> 140 = VSD creation/enlargement<br><input type="checkbox"/> 150 = Ventricular septal fenestration                                                                                                                                                                                       |
|                                   | AV Canal                                      | <input type="checkbox"/> 170 = AVC (AVSD) repair, Complete (CAVSD)<br><input type="checkbox"/> 180 = AVC (AVSD) repair, Intermediate (Transitional)<br><input type="checkbox"/> 190 = AVC (AVSD) repair, Partial (Incomplete) (PAVSD)<br><input type="checkbox"/> 2300 = Valvuloplasty, Common atrioventricular valve<br><input type="checkbox"/> 2250 = Valvuloplasty converted to valve replacement in the same operation, Common atrioventricular valve<br><input type="checkbox"/> 2230 = Valve replacement, Common atrioventricular valve |
|                                   | AP Window                                     | <input type="checkbox"/> 210 = AP window repair<br><input type="checkbox"/> 220 = Pulmonary artery origin from ascending aorta (hemitruncus) repair                                                                                                                                                                                                                                                                                                                                                                                            |
|                                   | Truncus Arteriosus                            | <input type="checkbox"/> 230 = Truncus arteriosus repair<br><input type="checkbox"/> 240 = Valvuloplasty, Truncal valve<br><input type="checkbox"/> 2290 = Valvuloplasty converted to valve replacement in the same operation, Truncal valve<br><input type="checkbox"/> 250 = Valve replacement, Truncal valve<br><input type="checkbox"/> 2220 = Truncus + Interrupted aortic arch repair (IAA) repair                                                                                                                                       |
| <b>Pulmonary Venous Anomalies</b> | Partial Anomalous Pulmonary Venous Connection | <input type="checkbox"/> 260 = PAPVC repair<br><input type="checkbox"/> 270 = PAPVC, Scimitar, Repair<br><input type="checkbox"/> 2120 = PAPVC repair, Baffle redirection to left atrium with systemic vein translocation (Warden) (SVC sewn to right atrial appendage)                                                                                                                                                                                                                                                                        |
|                                   | Total Anomalous Pulmonary Venous Connection   | <input type="checkbox"/> 280 = TAPVC repair<br><input type="checkbox"/> 2200 = TAPVC repair + Shunt - systemic-to-pulmonary                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Cor Triatriatum</b>            |                                               | <input type="checkbox"/> 290 = Cor triatriatum repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Pulmonary Venous Stenosis</b>  |                                               | <input type="checkbox"/> 300 = Pulmonary venous stenosis repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Systemic Venous Anomalies</b>  | Anomalous Systemic Venous Connection          | <input type="checkbox"/> 310 = Atrial baffle procedure (non-Mustard, non-Senning)<br><input type="checkbox"/> 330 = Anomalous systemic venous connection repair                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | Systemic venous obstruction                   | <input type="checkbox"/> 340 = Systemic venous stenosis repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                   |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Right Heart Lesions</b>        | Tetralogy of Fallot                           | <input type="checkbox"/> 350 = TOF repair, No ventriculotomy<br><input type="checkbox"/> 360 = TOF repair, Ventriculotomy, Nontransanular patch<br><input type="checkbox"/> 370 = TOF repair, Ventriculotomy, Transanular patch<br><input type="checkbox"/> 380 = TOF repair, RV-PA conduit<br><input type="checkbox"/> 390 = TOF - AVC (AVSD) repair<br><input type="checkbox"/> 400 = TOF - Absent pulmonary valve repair                                                                                                                    |
|                                   | Pulmonary Atresia                             | <input type="checkbox"/> 420 = Pulmonary atresia - VSD (including TOF, PA) repair<br><input type="checkbox"/> 430 = Pulmonary atresia - VSD - MAPCA (pseudotruncus) repair<br><input type="checkbox"/> 440 = Unifocalization MAPCA(s)<br><input type="checkbox"/> 450 = Occlusion MAPCA(s)                                                                                                                                                                                                                                                     |
|                                   | Tricuspid Valve Disease and Ebstein's Anomaly | <input type="checkbox"/> 460 = Valvuloplasty, Tricuspid<br><input type="checkbox"/> 2280 = Valvuloplasty converted to valve replacement in the same operation, Tricuspid                                                                                                                                                                                                                                                                                                                                                                       |

|                    |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                          | <input type="checkbox"/> 465 = Ebstein's repair<br><input type="checkbox"/> 470 = Valve replacement, Tricuspid (TVR)<br><input type="checkbox"/> 480 = Valve closure, Tricuspid (exclusion, univentricular approach)<br><input type="checkbox"/> 490 = Valve excision, Tricuspid (without replacement)<br><input type="checkbox"/> 500 = Valve surgery, Other, Tricuspid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | RVOT Obstruction, IVS Pulmonary Stenosis | <input type="checkbox"/> 510 = RVOT procedure<br><input type="checkbox"/> 520 = 1 1/2 ventricular repair<br><input type="checkbox"/> 530 = PA, reconstruction (plasty), Main (trunk)<br><input type="checkbox"/> 540 = PA, reconstruction (plasty), Branch, Central (within the hilar bifurcation)<br><input type="checkbox"/> 550 = PA, reconstruction (plasty), Branch, Peripheral (at or beyond the hilar bifurcation)<br><input type="checkbox"/> 570 = DCRV repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                    | Pulmonary Valve Disease                  | <input type="checkbox"/> 590 = Valvuloplasty, Pulmonic<br><input type="checkbox"/> 2270 = Valvuloplasty converted to valve replacement in the same operation, Pulmonic<br><input type="checkbox"/> 600 = Valve replacement, Pulmonic (PVR)<br><input type="checkbox"/> 630 = Valve excision, Pulmonary (without replacement)<br><input type="checkbox"/> 640 = Valve closure, Semilunar<br><input type="checkbox"/> 650 = Valve surgery, Other, Pulmonic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Conduit operations | Conduit operations                       | <input type="checkbox"/> 610 = Conduit placement, RV to PA<br><input type="checkbox"/> 620 = Conduit placement, LV to PA<br><input type="checkbox"/> 1774 = Conduit placement, Ventricle to aorta<br><input type="checkbox"/> 1772 = Conduit placement, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    | Conduit Stenosis / Insufficiency         | <input type="checkbox"/> 580 = Conduit reoperation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Left Heart Lesions | Aortic Valve Disease                     | <input type="checkbox"/> 660 = Valvuloplasty, Aortic<br><input type="checkbox"/> 2240 = Valvuloplasty converted to valve replacement in the same operation, Aortic<br><input type="checkbox"/> 2310 = Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross procedure<br><input type="checkbox"/> 2320 = Valvuloplasty converted to valve replacement in the same operation, Aortic – with Ross-Konno procedure<br><input type="checkbox"/> 670 = Valve replacement, Aortic (AVR)<br><input type="checkbox"/> 680 = Valve replacement, Aortic (AVR), Mechanical<br><input type="checkbox"/> 690 = Valve replacement, Aortic (AVR), Bioprosthetic<br><input type="checkbox"/> 700 = Valve replacement, Aortic (AVR), Homograft<br><input type="checkbox"/> 715 = Aortic root replacement, Bioprosthetic<br><input type="checkbox"/> 720 = Aortic root replacement, Mechanical<br><input type="checkbox"/> 730 = Aortic root replacement, Homograft<br><input type="checkbox"/> 735 = Aortic root replacement, Valve sparing<br><input type="checkbox"/> 740 = Ross procedure<br><input type="checkbox"/> 750 = Konno procedure<br><input type="checkbox"/> 760 = Ross-Konno procedure<br><input type="checkbox"/> 770 = Other annular enlargement procedure<br><input type="checkbox"/> 780 = Aortic stenosis, Subvalvar, Repair<br><input type="checkbox"/> 2100 = Aortic stenosis, Subvalvar, Repair, With myectomy for IHSS<br><input type="checkbox"/> 790 = Aortic stenosis, Supraaortic, Repair<br><input type="checkbox"/> 800 = Valve surgery, Other, Aortic |
|                    | Sinus of Valsalva Aneurysm               | <input type="checkbox"/> 810 = Sinus of Valsalva, Aneurysm repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | LV to Aorta Tunnel                       | <input type="checkbox"/> 820 = LV to aorta tunnel repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | Mitral Valve Disease                     | <input type="checkbox"/> 830 = Valvuloplasty, Mitral<br><input type="checkbox"/> 2260 = Valvuloplasty converted to valve replacement in the same operation, Mitral<br><input type="checkbox"/> 840 = Mitral stenosis, Supraaortic mitral ring repair<br><input type="checkbox"/> 850 = Valve replacement, Mitral (MVR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                    |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                     |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                                                 | <input type="checkbox"/> 860 = Valve surgery, Other, Mitral                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                     | Hypoplastic Left Heart                          | <input type="checkbox"/> 870 = Norwood procedure<br><input type="checkbox"/> 880 = HLHS biventricular repair<br><input type="checkbox"/> 2160 = Hybrid Approach "Stage 1", Application of RPA & LPA bands<br><input type="checkbox"/> 2170 = Hybrid Approach "Stage 1", Stent placement in arterial duct (PDA)<br><input type="checkbox"/> 2180 = Hybrid Approach "Stage 1", Stent placement in arterial duct (PDA) + application of RPA & LPA bands<br><input type="checkbox"/> 2140 = Hybrid approach "Stage 2", Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Aortic arch repair (Norwood [Stage 1] + Superior Cavopulmonary anastomosis(es) + PA Debanding)<br><input type="checkbox"/> 2150 = Hybrid approach "Stage 2", Aortopulmonary amalgamation + Superior Cavopulmonary anastomosis(es) + PA Debanding + Without aortic arch repair |
| Cardiomyopathy                      |                                                 | <input type="checkbox"/> 890 = Transplant, Heart<br><input type="checkbox"/> 900 = Transplant, Heart and lung<br><input type="checkbox"/> 910 = Partial left ventriculectomy (LV volume reduction surgery) (Batista)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Pericardial Disease                 |                                                 | <input type="checkbox"/> 920 = Pericardial drainage procedure<br><input type="checkbox"/> 930 = Pericardiectomy<br><input type="checkbox"/> 940 = Pericardial procedure, Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Single Ventricle                    |                                                 | <input type="checkbox"/> 950 = Fontan, Atrio-pulmonary connection<br><input type="checkbox"/> 960 = Fontan, Atrio-ventricular connection<br><input type="checkbox"/> 970 = Fontan, TCPC, Lateral tunnel, Fenestrated<br><input type="checkbox"/> 980 = Fontan, TCPC, Lateral tunnel, Nonfenestrated<br><input type="checkbox"/> 1000 = Fontan, TCPC, External conduit, Fenestrated<br><input type="checkbox"/> 1010 = Fontan, TCPC, External conduit, Nonfenestrated<br><input type="checkbox"/> 1025 = Fontan revision or conversion (Re-do Fontan)<br><input type="checkbox"/> 1030 = Fontan, Other<br><input type="checkbox"/> 2340 = Fontan + Atrioventricular valvuloplasty<br><input type="checkbox"/> 1035 = Ventricular septation                                                                                                                                              |
| Transposition of the Great Arteries | Congenitally Corrected TGA                      | <input type="checkbox"/> 1050 = Congenitally corrected TGA repair, Atrial switch and ASO (double switch)<br><input type="checkbox"/> 1060 = Congenitally corrected TGA repair, Atrial switch and Rastelli<br><input type="checkbox"/> 1070 = Congenitally corrected TGA repair, VSD closure<br><input type="checkbox"/> 1080 = Congenitally corrected TGA repair, VSD closure and LV to PA conduit<br><input type="checkbox"/> 1090 = Congenitally corrected TGA repair, Other                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                     | Transposition of the Great Arteries             | <input type="checkbox"/> 1110 = Arterial switch operation (ASO)<br><input type="checkbox"/> 1120 = Arterial switch operation (ASO) and VSD repair<br><input type="checkbox"/> 1123 = Arterial switch procedure + Aortic arch repair<br><input type="checkbox"/> 1125 = Arterial switch procedure and VSD repair + Aortic arch repair<br><input type="checkbox"/> 1130 = Senning<br><input type="checkbox"/> 1140 = Mustard<br><input type="checkbox"/> 1145 = Atrial baffle procedure, Mustard or Senning revision<br><input type="checkbox"/> 1150 = Rastelli<br><input type="checkbox"/> 1160 = REV<br><input type="checkbox"/> 2190 = Aortic root translocation over left ventricle (Including Nikaidoh procedure)<br><input type="checkbox"/> 2210 = TGA, Other procedures (Kawashima, LV-PA conduit, other)                                                                       |
| DORV                                |                                                 | <input type="checkbox"/> 1180 = DORV, Intraventricular tunnel repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| DOLV                                |                                                 | <input type="checkbox"/> 1200 = DOLV repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Thoracic Arteries and Veins         | Coarctation of Aorta and Aortic arch hypoplasia | <input type="checkbox"/> 1210 = Coarctation repair, End to end<br><input type="checkbox"/> 1220 = Coarctation repair, End to end, Extended<br><input type="checkbox"/> 1230 = Coarctation repair, Subclavian flap<br><input type="checkbox"/> 1240 = Coarctation repair, Patch aortoplasty<br><input type="checkbox"/> 1250 = Coarctation repair, Interposition graft<br><input type="checkbox"/> 1260 = Coarctation repair, Other<br><input type="checkbox"/> 1275 = Coarctation repair + VSD repair                                                                                                                                                                                                                                                                                                                                                                                  |

|                                         |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         |                                             | <input type="checkbox"/> 1280 = Aortic arch repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                         |                                             | <input type="checkbox"/> 1285 = Aortic arch repair + VSD repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                         | Coronary Artery Anomalies                   | <input type="checkbox"/> 1290 = Coronary artery fistula ligation<br><input type="checkbox"/> 1291 = Anomalous origin of coronary artery from pulmonary artery repair<br><input type="checkbox"/> 1300 = Coronary artery bypass<br><input type="checkbox"/> 1305 = Anomalous aortic origin of coronary artery from aorta (AAOCA) repair<br><input type="checkbox"/> 1310 = Coronary artery procedure, Other                                                                                                                                 |
|                                         | Interrupted Arch                            | <input type="checkbox"/> 1320 = Interrupted aortic arch repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                         | Patent Ductus Arteriosus                    | <input type="checkbox"/> 1330 = PDA closure, Surgical<br><input type="checkbox"/> 1340 = PDA closure, Device                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                         | Vascular Rings and Slings                   | <input type="checkbox"/> 1360 = Vascular ring repair<br><input type="checkbox"/> 1365 = Aortopexy<br><input type="checkbox"/> 1370 = Pulmonary artery sling repair                                                                                                                                                                                                                                                                                                                                                                         |
|                                         | Aortic Aneurysm                             | <input type="checkbox"/> 1380 = Aortic aneurysm repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Thoracic and Mediastinal Disease</b> | Aortic Dissection                           | <input type="checkbox"/> 1390 = Aortic dissection repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         | Lung Disease                                | <input type="checkbox"/> 1400 = Lung biopsy<br><input type="checkbox"/> 1410 = Transplant, lung(s)<br><input type="checkbox"/> 1420 = Lung procedure, Other                                                                                                                                                                                                                                                                                                                                                                                |
|                                         | Pectus Excavatum, Carinatum                 | <input type="checkbox"/> 1430 = Pectus repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                         | Tracheal Stenosis                           | <input type="checkbox"/> 1440 = Tracheal procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Electrophysiological</b>             |                                             | <input type="checkbox"/> 1450 = Pacemaker implantation, Permanent<br><input type="checkbox"/> 1460 = Pacemaker procedure<br><input type="checkbox"/> 2350 = Explantation of pacing system<br><input type="checkbox"/> 1470 = ICD (AICD) implantation<br><input type="checkbox"/> 1480 = ICD (AICD) ([automatic] implantable cardioverter defibrillator) procedure<br><input type="checkbox"/> 1490 = Arrhythmia surgery - atrial, Surgical Ablation<br><input type="checkbox"/> 1500 = Arrhythmia surgery - ventricular, Surgical Ablation |
|                                         | <b>Interventional Cardiology Procedures</b> | <input type="checkbox"/> 2500 = Cardiovascular catheterization procedure, Diagnostic                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                         |                                             | <input type="checkbox"/> 2520 = Cardiovascular catheterization procedure, Diagnostic, Angiographic data obtained                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                         |                                             | <input type="checkbox"/> 2550 = Cardiovascular catheterization procedure, Diagnostic, Electrophysiology alteration                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                         |                                             | <input type="checkbox"/> 2540 = Cardiovascular catheterization procedure, Diagnostic, Hemodynamic alteration                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                         |                                             | <input type="checkbox"/> 2510 = Cardiovascular catheterization procedure, Diagnostic, Hemodynamic data obtained                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                         |                                             | <input type="checkbox"/> 2530 = Cardiovascular catheterization procedure, Diagnostic, Transluminal test occlusion                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                         |                                             | <input type="checkbox"/> 2410 = Cardiovascular catheterization procedure, Therapeutic                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                         |                                             | <input type="checkbox"/> 2670 = Cardiovascular catheterization procedure, Therapeutic, Adjunctive therapy                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                         |                                             | <input type="checkbox"/> 1540 = Cardiovascular catheterization procedure, Therapeutic, Balloon dilation                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                         |                                             | <input type="checkbox"/> 2590 = Cardiovascular catheterization procedure, Therapeutic, Balloon valvotomy                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         |                                             | <input type="checkbox"/> 1580 = Cardiovascular catheterization procedure, Therapeutic, Coil implantation                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         |                                             | <input type="checkbox"/> 1560 = Cardiovascular catheterization procedure, Therapeutic, Device implantation                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                         |                                             | <input type="checkbox"/> 2640 = Cardiovascular catheterization procedure, Therapeutic, Perforation (establishing interchamber and/or intervessel communication)                                                                                                                                                                                                                                                                                                                                                                            |
|                                         |                                             | <input type="checkbox"/> 2580 = Cardiovascular catheterization procedure, Therapeutic, Septostomy                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                         |                                             | <input type="checkbox"/> 1550 = Cardiovascular catheterization procedure, Therapeutic, Stent insertion                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                         |                                             | <input type="checkbox"/> 2630 = Cardiovascular catheterization procedure, Therapeutic, Stent re-dilation                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         |                                             | <input type="checkbox"/> 2650 = Cardiovascular catheterization procedure, Therapeutic, Transcatheter Fontan completion                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                         |                                             | <input type="checkbox"/> 2660 = Cardiovascular catheterization procedure, Therapeutic, Transcatheter implantation of valve                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                         |                                             | <input type="checkbox"/> 2680 = Cardiovascular electrophysiological catheterization procedure                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                         |                                             | <input type="checkbox"/> 2690 = Cardiovascular electrophysiological catheterization procedure, Therapeutic ablation                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Palliative Procedures</b>    | <input type="checkbox"/> 1590 = Shunt, Systemic to pulmonary, Modified Blalock-Taussig Shunt (MBTS)<br><input type="checkbox"/> 1600 = Shunt, Systemic to pulmonary, Central (from aorta or to main pulmonary artery)<br><input type="checkbox"/> 1610 = Shunt, Systemic to pulmonary, Other<br><input type="checkbox"/> 1630 = Shunt, Ligation and takedown<br><input type="checkbox"/> 2095 = Shunt, Reoperation<br><input type="checkbox"/> 1640 = PA banding (PAB)<br><input type="checkbox"/> 1650 = PA debanding<br><input type="checkbox"/> 1660 = Damus-Kaye-Stansel procedure (DKS) (creation of AP anastomosis without arch reconstruction)<br><input type="checkbox"/> 1670 = Bidirectional cavopulmonary anastomosis (BDCPA) (bidirectional Glenn)<br><input type="checkbox"/> 1680 = Glenn (unidirectional cavopulmonary anastomosis) (unidirectional Glenn)<br><input type="checkbox"/> 1690 = Bilateral bidirectional cavopulmonary anastomosis (BBDCPA) (bilateral bidirectional Glenn)<br><input type="checkbox"/> 1700 = HemiFontan<br><input type="checkbox"/> 2330 = Superior cavopulmonary anastomosis(es) (Glenn or HemiFontan) + Atrioventricular valvuloplasty<br><input type="checkbox"/> 2130 = Superior Cavopulmonary anastomosis(es) + PA reconstruction<br><input type="checkbox"/> 1710 = Palliation, Other |
| <b>Mechanical Support</b>       | <input type="checkbox"/> 2360 = ECMO cannulation<br><input type="checkbox"/> 2370 = ECMO decannulation<br><input type="checkbox"/> 1910 = ECMO procedure<br><input type="checkbox"/> 1900 = Intraaortic balloon pump (IABP) insertion<br><input type="checkbox"/> 1920 = Right/left heart assist device procedure<br><input type="checkbox"/> 2390 = VAD explantation<br><input type="checkbox"/> 2380 = VAD implantation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Anesthetic procedures</b>    | <input type="checkbox"/> 2420 = Echocardiography procedure, Sedated transesophageal echocardiogram<br><input type="checkbox"/> 2430 = Echocardiography procedure, Sedated transthoracic echocardiogram<br><input type="checkbox"/> 2435 = Non-cardiovascular, Non-thoracic procedure on cardiac patient with cardiac anesthesia<br><input type="checkbox"/> 2440 = Radiology procedure on cardiac patient, Cardiac Computerized Axial Tomography (CT Scan)<br><input type="checkbox"/> 2450 = Radiology procedure on cardiac patient, Cardiac Magnetic Resonance Imaging (MRI)<br><input type="checkbox"/> 2460 = Radiology procedure on cardiac patient, Diagnostic radiology<br><input type="checkbox"/> 2470 = Radiology procedure on cardiac patient, Non-Cardiac Computerized Tomography (CT) on cardiac patient<br><input type="checkbox"/> 2480 = Radiology procedure on cardiac patient, Non-cardiac Magnetic Resonance Imaging (MRI) on cardiac patient<br><input type="checkbox"/> 2490 = Radiology procedure on cardiac patient, Therapeutic radiology                                                                                                                                                                                                                                                                         |
| <b>Miscellaneous Procedures</b> | <input type="checkbox"/> 1720 = Aneurysm, Ventricular, Right, Repair<br><input type="checkbox"/> 1730 = Aneurysm, Ventricular, Left, Repair<br><input type="checkbox"/> 1740 = Aneurysm, Pulmonary artery, Repair<br><input type="checkbox"/> 1760 = Cardiac tumor resection<br><input type="checkbox"/> 1780 = Pulmonary AV fistula repair/occlusion<br><input type="checkbox"/> 1790 = Ligation, Pulmonary artery<br><input type="checkbox"/> 1802 = Pulmonary embolectomy, Acute pulmonary embolus<br><input type="checkbox"/> 1804 = Pulmonary embolectomy, Chronic pulmonary embolus<br><input type="checkbox"/> 1810 = Pleural drainage procedure<br><input type="checkbox"/> 1820 = Pleural procedure, Other<br><input type="checkbox"/> 1830 = Ligation, Thoracic duct<br><input type="checkbox"/> 1840 = Decortication<br><input type="checkbox"/> 1850 = Esophageal procedure<br><input type="checkbox"/> 1860 = Mediastinal procedure<br><input type="checkbox"/> 1870 = Bronchoscopy                                                                                                                                                                                                                                                                                                                                          |

- ☐ 1880 = Diaphragm plication
- ☐ 1890 = Diaphragm procedure, Other
- ☐ 1930 = VATS (video-assisted thoracoscopic surgery)
- ☐ 1940 = Minimally invasive procedure
- ☐ 1950 = Bypass for noncardiac lesion
- ☐ 1960 = Delayed sternal closure
- ☐ 1970 = Mediastinal exploration
- ☐ 1980 = Sternotomy wound drainage
- ☐ 1990 = Thoracotomy, Other
- ☐ 2000 = Cardiotomy, Other
- ☐ 2010 = Cardiac procedure, Other
- ☐ 2020 = Thoracic and/or mediastinal procedure, Other
- ☐ 2030 = Peripheral vascular procedure, Other
- ☐ 2040 = Miscellaneous procedure, Other
- ☐ 2050 = Organ procurement
- ☐ 7777 = Other procedure

## OPERATIVE

|                            |                                                                                                                                                          |                                                                                                                                  |                                                                                                                                                        |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Procedure Location:</b> | <input type="checkbox"/> Cardiac OR<br><input type="checkbox"/> General OR<br><input type="checkbox"/> Hybrid Suite<br><input type="checkbox"/> Cath lab | <input type="checkbox"/> ICU<br><input type="checkbox"/> CVICU<br><input type="checkbox"/> NICU<br><input type="checkbox"/> PICU | <input type="checkbox"/> SICU<br><input type="checkbox"/> Radiology Suite<br><input type="checkbox"/> Procedure Room<br><input type="checkbox"/> Other |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|

|                        |                                                                                                             |                                                                                                                                                                                 |                                                                                                        |
|------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Operation Type:</b> | <input type="checkbox"/> CPB<br><input type="checkbox"/> Thoracic<br><input type="checkbox"/> VAD w/out CPB | <input type="checkbox"/> No CPB Cardiovascular<br><input type="checkbox"/> Interventional Cardiology<br><input type="checkbox"/> NonCardiac/NonThoracic Procedure w/ Anesthesia | <input type="checkbox"/> ECMO<br><input type="checkbox"/> VAD w/ CPB<br><input type="checkbox"/> Other |
|------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|

**If Op type is NonCardiac/NonThoracic Procedure w/Anesthesia, skip to Complications section**

|                         |                                  |                                 |
|-------------------------|----------------------------------|---------------------------------|
| Surgeon:                | Surgeon NPI:                     | Taxpayer Identification Number: |
| Assisting Surgeon:      | Assisting Surgeon NPI:           |                                 |
| Resident Surgeon:       | Resident Surgeon Identifier:     |                                 |
| Consultant Attending:   | Consultant Attending Identifier: |                                 |
| Referring Cardiologist: | Referring Physician:             |                                 |

|                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reoperation Within This Admission: <input type="checkbox"/> Yes – Planned reoperation <input type="checkbox"/> No <input type="checkbox"/> Yes – Unplanned reoperation |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                            |                                                |
|--------------------------------------------|------------------------------------------------|
| Number of Prior Cardiothoracic Operations: | Number of Prior CPB Cardiothoracic Operations: |
|--------------------------------------------|------------------------------------------------|

|                                                 |                                                            |
|-------------------------------------------------|------------------------------------------------------------|
| OR Entry Time: (00:00 – 23:59) ____: ____: ____ | Skin Incision Start Time: (00:00 – 23:59) ____: ____: ____ |
|-------------------------------------------------|------------------------------------------------------------|

(If operation type is No CPB Cardiovascular →) Cross Clamp Time – No CPB: (minutes):

(If operation type is CPB or VAD w/ CPB ↓)

|                                                                                                  |                                                                             |                                    |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------|
| CPB Time (minutes):                                                                              | Cross Clamp Time - CPB: (minutes):                                          | Circulatory Arrest Time (minutes): |
| <b>Patient Temperature Monitoring Site :</b> (If Yes, Lowest Core Temperature recorded at site): |                                                                             |                                    |
| Bladder:                                                                                         | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |
| Esophageal:                                                                                      | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |
| Nasopharyngeal:                                                                                  | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |
| Rectal:                                                                                          | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |
| Tympanic:                                                                                        | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |
| Other:                                                                                           | <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes →) ____ °C |                                    |

|                         |                           |
|-------------------------|---------------------------|
| Cooling Time: (minutes) | Rewarming Time: (minutes) |
|-------------------------|---------------------------|

|                                                                                                         |                                                                                |                                                                                                                                                                                 |                                                                               |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Cerebral Perfusion Utilized:</b> <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes ↓) |                                                                                |                                                                                                                                                                                 |                                                                               |
| Cerebral Perfusion Time: ____ (minutes)                                                                 |                                                                                |                                                                                                                                                                                 |                                                                               |
| <b>Cerebral Perfusion Cannulation Site:</b>                                                             | Innominate Artery <input type="checkbox"/> Yes <input type="checkbox"/> No     | Right Subclavian <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                       | Right Carotid Artery <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                                                                                         | Right Axillary Artery <input type="checkbox"/> Yes <input type="checkbox"/> No |                                                                                                                                                                                 | Superior Vena Cava <input type="checkbox"/> Yes <input type="checkbox"/> No   |
|                                                                                                         | Left Carotid Artery <input type="checkbox"/> Yes <input type="checkbox"/> No   |                                                                                                                                                                                 |                                                                               |
| Cerebral Perfusion Periods: ____                                                                        |                                                                                |                                                                                                                                                                                 |                                                                               |
| Cerebral Perfusion Flow Rate: ____ (mL/kg) per minute                                                   |                                                                                |                                                                                                                                                                                 |                                                                               |
| Cerebral Perfusion Temperature: ____ °C                                                                 |                                                                                |                                                                                                                                                                                 |                                                                               |
| <b>Arterial Blood Gas Management During Cooling:</b>                                                    |                                                                                | <input type="checkbox"/> Alpha STAT <input type="checkbox"/> pH STAT<br><input type="checkbox"/> pHSTAT cooling/Alpha STAT rewarming <input type="checkbox"/> Other Combination |                                                                               |
| Hematocrit Prior to Circulatory Arrest or Cerebral Perfusion: ____                                      |                                                                                |                                                                                                                                                                                 |                                                                               |

|                                                                                                       |                                                          |                                 |                                                          |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------|----------------------------------------------------------|
| <b>Cardioplegia Administered:</b> <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes ↓) |                                                          |                                 |                                                          |
| Cardioplegia Number of Doses: ____                                                                    |                                                          |                                 |                                                          |
| Cardioplegia Delivery Ratio:                                                                          | Blood Solution (BS) ____                                 | Cardioplegia Solution (CS) ____ |                                                          |
| Initial Delivery Route of Cardioplegia:                                                               |                                                          |                                 |                                                          |
| Antegrade Aortic Root                                                                                 | <input type="checkbox"/> Yes <input type="checkbox"/> No | Antegrade Right Coronary Ostia  | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Antegrade Left Coronary Ostia                                                                         | <input type="checkbox"/> Yes <input type="checkbox"/> No | Retrograde Coronary Sinus       | <input type="checkbox"/> Yes <input type="checkbox"/> No |



## Subsequent Delivery Route of Cardioplegia:

Antegrade Aortic Root

☐ Yes ☐ No

Antegrade Right Coronary Ostia

☐ Yes ☐ No

Antegrade Left Coronary Ostia

☐ Yes ☐ No

Retrograde Coronary Sinus

☐ Yes ☐ No

Longest Myocardial Ischemic Interval: \_\_\_\_\_ (minutes)

Cardioplegia Solution: ☐ Hyperpolarizing ☐ Depolarizing ☐ Modified Depolarizing ☐ None

Lowest Hematocrit on CPB: \_\_\_\_\_

Endotracheal Intubation Performed ☐ Yes ☐ No (If Yes ↓)

Intubation Date/Time:

(mm/dd/yyyy 00:00 – 23:59) \_\_\_\_/\_\_\_\_/\_\_\_\_ :\_\_

Initial Extubation Date/Time:

(mm/dd/yyyy 00:00 – 23:59) \_\_\_\_/\_\_\_\_/\_\_\_\_ :\_\_

Extubated in OR: ☐ Yes ☐ NoRe-Intubated After Initial Postoperative Extubation: ☐ Yes ☐ No (If Yes ↓)

Final Extubation Date/Time: (mm/dd/yyyy 00:00 – 23:59) \_\_\_\_/\_\_\_\_/\_\_\_\_ :\_\_

Time of Skin Closure: (00:00 – 23:59) \_\_\_\_:\_\_\_\_

OR Exit Time: (00:00 – 23:59) \_\_\_\_:\_\_\_\_

Extended Through Midnight: ☐ Yes ☐ NoPulmonary Vascular Resistance Measured: ☐ Yes ☐ No

(If Yes and WeightKg &gt;=40 →)

PVR: \_\_\_\_\_ (Wood units)

(If Yes and WeightKg &lt;40 →)

PVR Index: \_\_\_\_\_ (Wood units x m2)

Intraoperative Near Infrared Spectroscopy (NIRS) Cerebral Metrics Used: ☐ Yes ☐ No (If Yes ↓)Cerebral Oximeter Provided First Indication: ☐ Yes ☐ No

Pre-Induction Baseline Regional Oxygen Saturation: Left: \_\_\_\_ (%) Right \_\_\_\_ (%) Center \_\_\_\_ (%)

Cumulative Saturation Below Threshold: Left: \_\_\_\_ (minute-%) Right \_\_\_\_ (minute-%) Center \_\_\_\_ (minute-%)

Skin Closure Regional Oxygen Saturation: Left: \_\_\_\_ (%) Right \_\_\_\_ (%) Center \_\_\_\_ (%)

Cerebral Regional Oxygen Saturation Percentiles:

| Percentile Range: | <=30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | >90 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-----|
| Minutes:          |      |       |       |       |       |       |       |     |

Intraoperative Near Infrared Spectroscopy (NIRS) Somatic Metrics Used: ☐ Yes ☐ No (If Yes ↓)Somatic Oximeter Provided First Indication: ☐ Yes ☐ NoSomatic Sensor Location: ☐ Renal ☐ Mesenteric

Pre-Induction Baseline Somatic Regional Oxygen Saturation: \_\_\_\_ (%)

Cumulative Somatic Saturation Below Threshold: \_\_\_\_ (minute-%)

Somatic Regional Oxygen Saturation Percentiles:

| Percentile Range: | <=30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | >90 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-----|
| Minutes:          |      |       |       |       |       |       |       |     |

Postoperative Near Infrared Spectroscopy (NIRS) Cerebral Metrics Used: ☐ Yes ☐ No (If Yes ↓)Cerebral Oximeter Provided First Indication: ☐ Yes ☐ No

Cumulative Cerebral Saturation Below Threshold:

Left: \_\_\_\_ (minute-%) Right: \_\_\_\_ (minute-%) Center: \_\_\_\_ (minute-%)

Cerebral Regional Oxygen Saturation Percentiles:

| Percentile Range: | <=30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | >90 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-----|
| Minutes:          |      |       |       |       |       |       |       |     |

Postoperative Near Infrared Spectroscopy (NIRS) Somatic Metrics Used: ☐ Yes ☐ No (If Yes ↓)Somatic Oximeter Provided First Indication: ☐ Yes ☐ NoSomatic Sensor Location: ☐ Renal ☐ Mesenteric

Cumulative Somatic Saturation Below Threshold: \_\_\_\_ (minute-%)

Somatic Regional Oxygen Saturation Percentiles:

| Percentile Range: | <=30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | >90 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-----|
| Minutes:          |      |       |       |       |       |       |       |     |

Intraop Blood Products Used: ☐ Yes ☐ No(If No →) Intraop Blood Products Refused: ☐ Yes ☐ No

(If Yes ↓)

Number of donor exposures:

Number of Units:

Number of Milliliters:

Red Blood Cells ☐ Yes ☐ No (If Yes →)Fresh Frozen Plasma ☐ Yes ☐ No (If Yes →)

|                 |                                                          |            |                                       |       |       |
|-----------------|----------------------------------------------------------|------------|---------------------------------------|-------|-------|
| Cryoprecipitate | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | _____                                 | _____ | _____ |
| Platelets       | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | _____                                 | _____ | _____ |
| Whole Blood     | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | _____                                 | _____ | _____ |
| Factor VIIa     | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | Total Dosage: _____ (micrograms / kg) |       |       |

**Intraop Medications:**

|                             |                                                          |            |                   |           |           |
|-----------------------------|----------------------------------------------------------|------------|-------------------|-----------|-----------|
| Aprotinin:                  | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | Aprotinin – Dose: | Full Dose | Half Dose |
| Epsilon Amino-Caproic Acid: | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | Dose:             | _____     |           |
| Desmopressin:               | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | Dose:             | _____     |           |
| Tranexamic Acid:            | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) | Dose:             | _____     |           |

| POST OPERATIVE                                                                                |                                                          |                            |                                       |                        |       |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------|---------------------------------------|------------------------|-------|
| Blood Products Used Postoperatively: <input type="checkbox"/> Yes <input type="checkbox"/> No |                                                          |                            |                                       |                        |       |
| (If Yes ↓)                                                                                    |                                                          | Number of donor exposures: | Number of Units:                      | Number of Milliliters: |       |
| Red Blood Cells                                                                               | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | _____                                 | _____                  | _____ |
| Fresh Frozen Plasma                                                                           | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | _____                                 | _____                  | _____ |
| Cryoprecipitate                                                                               | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | _____                                 | _____                  | _____ |
| Platelets                                                                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | _____                                 | _____                  | _____ |
| Whole Blood                                                                                   | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | _____                                 | _____                  | _____ |
| Factor VIIa                                                                                   | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →)                 | Total Dosage: _____ (micrograms / kg) |                        |       |

| COMPLICATIONS                                  |                                                                                                                                                                                     |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> 15 = No complications |                                                                                                                                                                                     |
| OR select ALL that apply: (↓)                  |                                                                                                                                                                                     |
| <input type="checkbox"/>                       | 16 = No complications during the intraoperative and postoperative time periods (No complications prior to discharge and no complications within < or = 30 days of surgery)          |
| <input type="checkbox"/>                       | 350 = Intraoperative death or intraprocedural death                                                                                                                                 |
| <input type="checkbox"/>                       | 360 = Unplanned readmission to the hospital within 30 days of surgery or intervention                                                                                               |
| <input type="checkbox"/>                       | 370 = Multi-System Organ Failure (MSOF) = Multi-Organ Dysfunction Syndrome (MODS)                                                                                                   |
| <input type="checkbox"/>                       | 30 = Cardiac arrest, Timing = Cardiac arrest (MI) during or following procedure (Perioperative/Periprocedural = Intraoperative/Intraprocedural and/or Postoperative/Postprocedural) |
| <input type="checkbox"/>                       | 80 = Cardiac dysfunction resulting in low cardiac output                                                                                                                            |
| <input type="checkbox"/>                       | 384 = Cardiac failure (severe cardiac dysfunction)                                                                                                                                  |
| <input type="checkbox"/>                       | 280 = Endocarditis-postprocedural infective endocarditis                                                                                                                            |
| <input type="checkbox"/>                       | 110 = Pericardial effusion, Requiring drainage                                                                                                                                      |
| <input type="checkbox"/>                       | 390 = Pulmonary hypertension                                                                                                                                                        |
| <input type="checkbox"/>                       | 140 = Pulmonary hypertensive crisis (PA pressure > systemic pressure)                                                                                                               |
| <input type="checkbox"/>                       | 130 = Pulmonary vein obstruction                                                                                                                                                    |
| <input type="checkbox"/>                       | 120 = Systemic vein obstruction                                                                                                                                                     |
| <input type="checkbox"/>                       | 240 = Bleeding, Requiring reoperation                                                                                                                                               |
| <input type="checkbox"/>                       | 102 = Sternum left open, Planned                                                                                                                                                    |
| <input type="checkbox"/>                       | 104 = Sternum left open, Unplanned                                                                                                                                                  |
| <input type="checkbox"/>                       | 22 = Unplanned cardiac reoperation during the postoperative or postprocedural time period, exclusive of reoperation for bleeding                                                    |
| <input type="checkbox"/>                       | 24 = Unplanned interventional cardiovascular catheterization procedure during the postoperative or postprocedural time period                                                       |
| <input type="checkbox"/>                       | 26 = Unplanned non-cardiac reoperation during the postoperative or postprocedural time period                                                                                       |
| <input type="checkbox"/>                       | 40 = Postoperative/Postprocedural mechanical circulatory support (IABP, VAD, ECMO, or CPS)                                                                                          |

- ☐ 71 = Arrhythmia
- ☐ 72 = Arrhythmia requiring drug therapy
- ☐ 73 = Arrhythmia requiring electrical cardioversion or defibrillation
- ☐ 74 = Arrhythmia necessitating pacemaker, Permanent pacemaker
- ☐ 75 = Arrhythmia necessitating pacemaker, Temporary pacemaker
- ☐ 210 = Chylothorax
- ☐ 200 =Pleural effusion, Requiring drainage
- ☐ 180 = Pneumonia
- ☐ 190 = Pneumothorax, Requiring intervention
- ☐ 150 = Postoperative/Postprocedural respiratory insufficiency requiring mechanical ventilatory support > 7 days
- ☐ 160 = Postoperative/Postprocedural respiratory insufficiency requiring reintubation
- ☐ 170 = Respiratory failure, Requiring tracheostomy
- ☐ 230 = Renal failure - acute renal failure, Acute renal failure requiring dialysis at the time of hospital discharge
- ☐ 223 = Renal failure - acute renal failure, Acute renal failure requiring temporary dialysis with the need for dialysis not present at hospital discharge
- ☐ 224 = Renal failure - acute renal failure, Acute renal failure requiring temporary hemofiltration with the need for dialysis not present at hospital discharge
- ☐ 290= Sepsis
- ☐ 320 = Neurological deficit, Neurological deficit persisting at discharge
- ☐ 325 = Neurological deficit, Transient neurological deficit not present at discharge
- ☐ 300 = Paralyzed diaphragm (possible phrenic nerve injury)
- ☐ 400 = Peripheral nerve injury, Neurological deficit persisting at discharge
- ☐ 331 = Seizure
- ☐ 410 = Spinal cord injury, Neurological deficit persisting at discharge
- ☐ 420 = Stroke
- ☐ 310 = Vocal cord dysfunction (possible recurrent laryngeal nerve injury)
- ☐ 250 = Wound dehiscence (sterile)
- ☐ 255 = Wound dehiscence (sterile), Median sternotomy
- ☐ 261 = Wound infection
- ☐ 262 = Wound infection-Deep wound infection
- ☐ 270 = Wound infection-Mediastinitis
- ☐ 263 = Wound infection-Superficial wound infection
- ☐ 900 = Other complication
- ☐ 901 = Other operative/procedural complication

## DISCHARGE/READMISSION

Reoperation after this operation within this admission: ☐ Yes ☐ No

Date of Hospital Discharge: (mm/dd/yyyy) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Mortality Status at Hospital Discharge: ☐ Alive ☐ Dead

(If Alive →) Discharge Location: ☐ Home ☐ Other Acute Care Center ☐ Other Chronic Care Center

Date of Database Discharge: (mm/dd/yyyy) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Mortality Status at Database Discharge: ☐ Alive ☐ Dead ☐ Unknown (If Alive ✓)

Readmission within 30 days: ☐ Yes ☐ No (If Yes →)

Readmission Date: (mm/dd/yyyy) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

(If Yes →) Primary Readmission Reason (select one ↓):

- |                                                                    |                                                                                        |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <input type="checkbox"/> 26 = Thrombotic Complication              | <input type="checkbox"/> 33 = Neurologic Complication                                  |
| <input type="checkbox"/> 27 = Embolic Complication                 | <input type="checkbox"/> 7 = Respiratory Complication/Airway Complication              |
| <input type="checkbox"/> 28 = Hemorrhagic Complication             | <input type="checkbox"/> 34 = Septic/Infectious Complication                           |
| <input type="checkbox"/> 29 = Stenotic Complication                | <input type="checkbox"/> 35 = Cardiovascular Device Complications                      |
| <input type="checkbox"/> 2 = Arrhythmias/Heart Block               | <input type="checkbox"/> 36 = Residual/Recurrent Cardiovascular Defects                |
| <input type="checkbox"/> 3 = Congestive Heart Failure              | <input type="checkbox"/> 37 = Failure to Thrive                                        |
| <input type="checkbox"/> 30 = Cardiac Transplant Rejection         | <input type="checkbox"/> 25 = VAD Complications                                        |
| <input type="checkbox"/> 31 = Myocardial Ischemia                  | <input type="checkbox"/> 39 = Gastrointestinal Complication                            |
| <input type="checkbox"/> 14 = Renal Failure                        | <input type="checkbox"/> 38 = Other Cardiovascular Complication                        |
| <input type="checkbox"/> 6 = Pericardial Effusion and/or Tamponade | <input type="checkbox"/> 998 = Other - Readmission related to this index operation     |
| <input type="checkbox"/> 32 = Pleural Effusion                     | <input type="checkbox"/> 999 = Other - Readmission not related to this index operation |

Status at 30 days after surgery: ☐ Alive ☐ Dead ☐ Unknown

Mortality Assigned to this Operation: ☐ Yes ☐ No Operative Mortality: ☐ Yes ☐ No

## ANESTHESIA

### ANESTHESIA Administrative

Primary Anesthesiologist Attending: \_\_\_\_\_

Secondary Anesthesiologist Attending ☐ Yes ☐ No (If Yes →) Name: \_\_\_\_\_

Fellow or Resident Present ☐ Yes ☐ No

CRNA/SRNA Present ☐ Yes ☐ No (If Yes →) Name: \_\_\_\_\_

Non-CV Physician: \_\_\_\_\_

### ANESTHESIA Preoperative

Preoperative Medications: ☐ None (If not None, select all pre-operative medications that apply: ↓)

- |                                                       |                                                                                            |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Amiodarone                   | <input type="checkbox"/> Lisinopril                                                        |
| <input type="checkbox"/> Aspirin                      | <input type="checkbox"/> Midazolam (Versed)                                                |
| <input type="checkbox"/> Bosentan                     | <input type="checkbox"/> Milrinone                                                         |
| <input type="checkbox"/> Captopril (Capoten)          | <input type="checkbox"/> Morphine                                                          |
| <input type="checkbox"/> Clopidogrel                  | <input type="checkbox"/> Nitroglycerin                                                     |
| <input type="checkbox"/> Coumadin                     | <input type="checkbox"/> Nitroprusside                                                     |
| <input type="checkbox"/> Digoxin                      | <input type="checkbox"/> Norepinephrine (Levophed)                                         |
| <input type="checkbox"/> Diltiazem                    | <input type="checkbox"/> Propranolol                                                       |
| <input type="checkbox"/> Dobutamine                   | <input type="checkbox"/> Prostaglandin                                                     |
| <input type="checkbox"/> Dopamine                     | <input type="checkbox"/> Sildenafil                                                        |
| <input type="checkbox"/> Enalapril                    | <input type="checkbox"/> Sotalol                                                           |
| <input type="checkbox"/> Epinephrine (Adrenalin)      | <input type="checkbox"/> Vasopressin                                                       |
| <input type="checkbox"/> Esmolol (Brevibloc)          | <input type="checkbox"/> ACE inhibitors not otherwise listed                               |
| <input type="checkbox"/> Fentanyl                     | <input type="checkbox"/> Beta Blockers not otherwise listed                                |
| <input type="checkbox"/> Furosemide (Lasix)           | <input type="checkbox"/> Anti-arrhythmics not otherwise listed                             |
| <input type="checkbox"/> Heparin                      | <input type="checkbox"/> Inotropes not otherwise listed (e.g., study drugs (levosimendan)) |
| <input type="checkbox"/> Low Molecular Weight Heparin | <input type="checkbox"/> Vasodilators not otherwise listed                                 |
| <input type="checkbox"/> Labetolol                    | <input type="checkbox"/> Vasoconstrictors not otherwise listed                             |

Preoperative Sedation ☐ Yes ☐ No

(If Yes →) Preoperative Sedation Route: ☐ IM ☐ IV ☐ Nasal ☐ PO (Oral) ☐ Rectal

(If Yes, select all pre-operative sedation drugs that apply: ↓)

- |                                                                         |                                                                        |
|-------------------------------------------------------------------------|------------------------------------------------------------------------|
| Atropine <input type="checkbox"/> Yes <input type="checkbox"/> No       | Lorazepam <input type="checkbox"/> Yes <input type="checkbox"/> No     |
| Demerol <input type="checkbox"/> Yes <input type="checkbox"/> No        | Midazolam <input type="checkbox"/> Yes <input type="checkbox"/> No     |
| Diazepam <input type="checkbox"/> Yes <input type="checkbox"/> No       | Morphine <input type="checkbox"/> Yes <input type="checkbox"/> No      |
| Glycopyrrolate <input type="checkbox"/> Yes <input type="checkbox"/> No | Pentobarbital <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Ketamine <input type="checkbox"/> Yes <input type="checkbox"/> No       |                                                                        |

Preoperative Oxygen Saturation: \_\_\_\_\_ %

Date and Time of Transport to Procedure Location Or Anesthesia Start Time: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ : \_\_\_\_

**ANESTHESIA Monitoring**

|                                             |                                                                                                                                                                                                     |                                          |                                                            |                                                          |                       |                                                          |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|----------------------------------------------------------|-----------------------|----------------------------------------------------------|
| Arterial Line                               | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            | (If Yes →) Type: (Select all that apply) | Radial                                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No | Brachial              | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Axillary                                                   | <input type="checkbox"/> Yes <input type="checkbox"/> No | Femoral               | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Ulnar                                                      | <input type="checkbox"/> Yes <input type="checkbox"/> No | Dorsalis Pedis        | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Posterior Tibial                                           | <input type="checkbox"/> Yes <input type="checkbox"/> No | Central               | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          |                                                            |                                                          |                       |                                                          |
| Cutdown                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            | (If Yes →) Type: (Select all that apply) | Radial                                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No | Femoral               | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Ulnar                                                      | <input type="checkbox"/> Yes <input type="checkbox"/> No | Other                 | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          |                                                            |                                                          |                       |                                                          |
| Percutaneous Central Pressure               | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |
|                                             | (If Yes →) Location: (Select all that apply)                                                                                                                                                        |                                          | Right Internal Jugular                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No | Left Internal Jugular | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Right Subclavian                                           | <input type="checkbox"/> Yes <input type="checkbox"/> No | Left Subclavian       | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Right Femoral Vein                                         | <input type="checkbox"/> Yes <input type="checkbox"/> No | Left Femoral Vein     | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                             |                                                                                                                                                                                                     |                                          | Other                                                      | <input type="checkbox"/> Yes <input type="checkbox"/> No |                       |                                                          |
|                                             |                                                                                                                                                                                                     |                                          |                                                            |                                                          |                       |                                                          |
| CVP Placed by Anesthesia                    | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |
| Swan-Ganz Catheter                          | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |
| Oximetric Central Line (ScVO2)              | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |
| Neurologic Monitoring                       | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |
|                                             | (If Yes →) Neurological Monitoring Type:                                                                                                                                                            |                                          | <input type="checkbox"/> Near Infrared Spectroscopy (NIRS) | <input type="checkbox"/> Transcranial Doppler (TCD)      |                       |                                                          |
|                                             |                                                                                                                                                                                                     |                                          | <input type="checkbox"/> Bispectral Index (BIS)            | <input type="checkbox"/> Other                           |                       |                                                          |
|                                             |                                                                                                                                                                                                     |                                          |                                                            |                                                          |                       |                                                          |
| Lowest Recorded Intraoperative Temperature: | _____ ° C                                                                                                                                                                                           |                                          |                                                            |                                                          |                       |                                                          |
| Intraoperative Temperature Site:            | <input type="checkbox"/> Nasal <input type="checkbox"/> Esophageal <input type="checkbox"/> Bladder <input type="checkbox"/> Rectal <input type="checkbox"/> Axillary <input type="checkbox"/> Skin |                                          |                                                            |                                                          |                       |                                                          |
| Transesophageal Echocardiography            | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                            |                                          |                                                            |                                                          |                       |                                                          |

**ANESTHESIA Anesthetic Technique**

Date and Time of Induction: \_\_\_\_/\_\_\_\_/\_\_\_\_ : \_\_\_\_:\_\_\_\_  
mm/dd/yyyy hh:mm

Induction Type:

|                    |                                                          |                                    |                                                                                                        |
|--------------------|----------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------|
| Inhalation         | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) Primary Induction Agent | <input type="checkbox"/> Sevoflurane <input type="checkbox"/> Halothane                                |
| Intravenous        | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) Primary Induction Agent | <input type="checkbox"/> Propofol <input type="checkbox"/> Etomidate <input type="checkbox"/> Ketamine |
|                    |                                                          |                                    | <input type="checkbox"/> Sodium Thiopental <input type="checkbox"/> Fentanyl                           |
|                    |                                                          |                                    | <input type="checkbox"/> Sufentanil <input type="checkbox"/> Midazolam                                 |
| Intramuscular (IM) | <input type="checkbox"/> Yes <input type="checkbox"/> No | (If Yes →) Primary Induction Agent | <input type="checkbox"/> Ketamine <input type="checkbox"/> Midazolam                                   |

Primary Maintenance Agent:

|                                     |                                     |                                          |                                       |                                      |                                     |                                   |
|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------|--------------------------------------|-------------------------------------|-----------------------------------|
| <input type="checkbox"/> Alfentanil | <input type="checkbox"/> Desflurane | <input type="checkbox"/> Dexmedetomidine | <input type="checkbox"/> Fentanyl     | <input type="checkbox"/> Halothane   | <input type="checkbox"/> Isoflurane | <input type="checkbox"/> Ketamine |
| <input type="checkbox"/> Midazolam  | <input type="checkbox"/> Morphine   | <input type="checkbox"/> Propofol        | <input type="checkbox"/> Remifentanyl | <input type="checkbox"/> Sevoflurane | <input type="checkbox"/> Sufentanil |                                   |

Regional Anesthetic ☐ Yes ☐ No

(If Yes →) Regional Anesthetic Site:

|                                                         |                                                        |                                                   |
|---------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------|
| <input type="checkbox"/> Thoracic Epidural Catheter     | <input type="checkbox"/> Lumbar Epidural Catheter      | <input type="checkbox"/> Caudal Epidural Catheter |
| <input type="checkbox"/> Lumbar Epidural – Single shot  | <input type="checkbox"/> Caudal Epidural – Single shot |                                                   |
| <input type="checkbox"/> Lumbar Intrathecal Single Shot |                                                        |                                                   |

(If Yes →) Regional Anesthetic Drug: (Select all that apply)

|                      |                                                          |                      |                                                          |
|----------------------|----------------------------------------------------------|----------------------|----------------------------------------------------------|
| Bupivacaine          | <input type="checkbox"/> Yes <input type="checkbox"/> No | Bupivacaine/Fentanyl | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Clonidine            | <input type="checkbox"/> Yes <input type="checkbox"/> No | Fentanyl             | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Hydromorphone        | <input type="checkbox"/> Yes <input type="checkbox"/> No | Lidocaine            | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Morphine             | <input type="checkbox"/> Yes <input type="checkbox"/> No | Ropivacaine          | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Ropivacaine/Fentanyl | <input type="checkbox"/> Yes <input type="checkbox"/> No | Tetracaine           | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Other                | <input type="checkbox"/> Yes <input type="checkbox"/> No |                      |                                                          |

**ANESTHESIA Airway**

Airway Type:

|                                                  |                                       |                                         |                                                      |
|--------------------------------------------------|---------------------------------------|-----------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> No airway support       | <input type="checkbox"/> Bag-mask     | <input type="checkbox"/> Nasal cannulae | <input type="checkbox"/> Laryngeal Mask Airway (LMA) |
| <input type="checkbox"/> Endotracheal intubation | <input type="checkbox"/> Tracheostomy |                                         |                                                      |

(If LMA →) Airway Size (mm): ☐ 1.0 ☐ 1.5 ☐ 2.0 ☐ 2.5 ☐ 3.0 ☐ 4.0 ☐ 5.0

(If Endotracheal intubation →) Airway Size (mm):

|                              |                              |                              |                              |                              |                              |
|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| <input type="checkbox"/> 2.5 | <input type="checkbox"/> 3.0 | <input type="checkbox"/> 3.5 | <input type="checkbox"/> 4.0 | <input type="checkbox"/> 4.5 | <input type="checkbox"/> 5.0 |
| <input type="checkbox"/> 5.5 | <input type="checkbox"/> 6.0 | <input type="checkbox"/> 6.5 | <input type="checkbox"/> 7.0 | <input type="checkbox"/> 7.5 | <input type="checkbox"/> 8.0 |

Cuffed ☐ Yes ☐ No

**ANESTHESIA Transfusion**

Transfusion ☐ Yes ☐ No

*(If Yes ↓)*

Number of donor exposures:

Packed Red Blood Cells (PRBC)

☐ Yes ☐ No

*(If Yes →)*

\_\_\_\_\_

Platelets

☐ Yes ☐ No

*(If Yes →)*

\_\_\_\_\_

Fresh Frozen Plasma (FFP)

☐ Yes ☐ No

*(If Yes →)*

\_\_\_\_\_

Cryoprecipitate

☐ Yes ☐ No

*(If Yes →)*

\_\_\_\_\_

Whole Blood

☐ Yes ☐ No

*(If Yes →)*

\_\_\_\_\_

Factor VIIa

☐ Yes ☐ No

*(If Yes →)*

Total dosage : \_\_\_\_\_ (micrograms / kg)

**ANESTHESIA Intraoperative Pharmacology**

Intraoperative Medications:

☐ None

*(If not None, select all intra-operative medications that apply: ↓)*
☐ Adenosine bolus

☐ Milrinone bolus/infusion

☐ Alfentanil infusion

☐ Morphine bolus/infusion

☐ Aminocaproic Acid (Amicar)

☐ Nesiritide Infusion

☐ Amiodarone bolus/infusion

☐ Nicardipine Infusion

☐ Aprotinin (Trasylol)

☐ Nitric Oxide inhalation

☐ Calcium (Gluconate or Chloride) infusion

☐ Nitroglycerin (Tridil) infusion

☐ Dexmetomidine (Precedex)

☐ Nitroprusside (Nipride)

☐ Dobutamine infusion

☐ Phenoxybenzamine bolus

☐ Dopamine infusion

☐ Phentolamine (Regitine) Bolus/Infusion

☐ Epinephrine (Adrenalin) infusion

☐ Phenylephrine infusion

☐ Esmolol bolus/infusion

☐ Propofol (Diprivan) infusion

☐ Fentanyl bolus/infusion

☐ Prostaglandin infusion

☐ Furosemide bolus/infusion

☐ Remifentanyl infusion

☐ Insulin bolus/infusion

☐ Thyroid Hormone bolus/infusion

☐ Intraoperative Steroids  
(Hydrocortisone/Methylprednisolone/Dexamethasone)

☐ Tranexamic Acid infusion

☐ Isoproterenol infusion

☐ Vasopressin infusion

☐ Levophed (Norepinephrine) infusion

☐ Other Inotrope

☐ Magnesium Sulfate bolus

☐ Other Vasodilator

☐ Midazolam bolus/infusion

☐ Other Vasoconstrictor

**ANESTHESIA Pharmacology On Arrival To ICU/PACU**

Medications Given At Time Of Transfer:

☐ None

*(If not None, select all medications that apply: ↓)*
☐ Aminocaproic Acid (Amicar) infusion

☐ Nesiritide Infusion

☐ Amiodarone infusion

☐ Nicardipine infusion

☐ Aprotinin (Trasylol ) infusion

☐ Nitric Oxide inhalation

☐ Calcium Chloride infusion

☐ Nitroglycerin (Tridil) infusion

☐ Calcium Gluconate infusion

☐ Nitroprusside (Nipride) infusion

☐ Dexmetomidine (Precedex) infusion

☐ Norepinephrine (Levophed) infusion

☐ Dobutamine infusion

☐ Phentolamine (Regitine) Infusion

☐ Dopamine infusion

☐ Phenylephrine infusion

☐ Epinephrine (Adrenalin) infusion

☐ Propofol (Diprivan) infusion

☐ Fentanyl infusion

☐ Prostaglandin infusion

☐ Insulin infusion

☐ Thyroid Hormone infusion

☐ Isoproterenol infusion

☐ Tranexamic Acid infusion

☐ Midazolam (Versed) infusion

☐ Vasopressin infusion

☐ Milrinone infusion

☐ Other Inotrope

☐ Morphine infusion

☐ Other Vasodilator

☐ Muscle Relaxant infusion

☐ Other Vasoconstrictor

**ANESTHESIA ICU/PACU Care**

Date and Time of ICU/PACU Arrival: \_\_\_\_/\_\_\_\_/\_\_\_\_ : \_\_\_\_:\_\_\_\_  
mm/dd/yyyy hh:mm

Initial FiO2: \_\_\_\_\_

Mechanical circulatory support ☐ Yes ☐ No

| ANESTHESIA Anesthesia Adverse Events                                         |                               |                                                        |
|------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------|
| Anesthesia adverse events:                                                   | <input type="checkbox"/> None | (If not None, select all adverse events that apply: ↓) |
| <input type="checkbox"/> Dental Injury                                       |                               |                                                        |
| <input type="checkbox"/> Respiratory Arrest                                  |                               |                                                        |
| <input type="checkbox"/> Difficult Intubation/Reintubation                   |                               |                                                        |
| <input type="checkbox"/> Stridor / Sub-glottic Stenosis                      |                               |                                                        |
| <input type="checkbox"/> Extubation                                          |                               |                                                        |
| <input type="checkbox"/> Endotracheal Tube Migration                         |                               |                                                        |
| <input type="checkbox"/> Airway Injury                                       |                               |                                                        |
| <input type="checkbox"/> Arrythmia - Central Venous Line Placement           |                               |                                                        |
| <input type="checkbox"/> Myocardial Injury - Central Venous Line Placement   |                               |                                                        |
| <input type="checkbox"/> Vascular Compromise - Central Venous Line Placement |                               |                                                        |
| <input type="checkbox"/> Pneumothorax - Central Venous Line Placement        |                               |                                                        |
| <input type="checkbox"/> Vascular Access                                     |                               |                                                        |
| <input type="checkbox"/> Hematoma                                            |                               |                                                        |
| <input type="checkbox"/> Arterial Puncture                                   |                               |                                                        |
| <input type="checkbox"/> Intravenous/Intra-arterial Air Embolism             |                               |                                                        |
| <input type="checkbox"/> Bleeding - Regional Anesthetic Site                 |                               |                                                        |
| <input type="checkbox"/> Intrathecal Puncture - Regional                     |                               |                                                        |
| <input type="checkbox"/> Local Anesthetic Toxicity - Regional                |                               |                                                        |
| <input type="checkbox"/> Neurologic Injury - Regional                        |                               |                                                        |
| <input type="checkbox"/> Anaphylaxis/Anaphylactoid Reaction                  |                               |                                                        |
| <input type="checkbox"/> Non-allergic Drug Reaction                          |                               |                                                        |
| <input type="checkbox"/> Medication Administration                           |                               |                                                        |
| <input type="checkbox"/> Medication Dosage                                   |                               |                                                        |
| <input type="checkbox"/> Intraoperative Recall                               |                               |                                                        |
| <input type="checkbox"/> Malignant Hyperthermia                              |                               |                                                        |
| <input type="checkbox"/> Protamine Reaction                                  |                               |                                                        |
| <input type="checkbox"/> Cardiac Arrest - Unrelated To Surgery               |                               |                                                        |
| <input type="checkbox"/> Esophageal Bleeding / Rupture                       |                               |                                                        |
| <input type="checkbox"/> Esophageal Chemical Burn                            |                               |                                                        |
| <input type="checkbox"/> Airway Compromise                                   |                               |                                                        |
| <input type="checkbox"/> TEE Related-Extubation                              |                               |                                                        |
| <input type="checkbox"/> Patient Transfer Event                              |                               |                                                        |
| <input type="checkbox"/> Neurologic Injury                                   |                               |                                                        |

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Renal Failure – Dialysis: ☐ Yes ☐ No

Hypertension: ☐ Yes ☐ No

Infectious Endocarditis: ☐ Yes ☐ No (If Yes →) Infectious Endocarditis Type: ☐ Treated ☐ Active

Chronic Lung Disease: ☐ No ☐ Mild ☐ Moderate ☐ Severe

Immunosuppressive Therapy: ☐ Yes ☐ No

Peripheral Arterial Disease: ☐ Yes ☐ No

Cerebrovascular Disease: ☐ Yes ☐ No

(If Yes →) Coma: ☐ Yes ☐ No

CVA: ☐ Yes ☐ No (If Yes →) CVA-When: ☐ Recent (<=2 weeks) ☐ Remote (>2 weeks)

CVD TIA: ☐ Yes ☐ No

CVD NonInvasive >75%: ☐ Yes ☐ No

CVD Prior Carotid Surgery: ☐ Yes ☐ No

### CORONARY BYPASS (if 18 yrs or older)

Coronary Artery Bypass Grafting Done: ☐ Yes ☐ No (If Yes ↓)

Number of Distal Anastomoses with Arterial Conduits: \_\_\_\_\_

Number of Distal Anastomoses with Venous Conduits: \_\_\_\_\_

(If 1 or more →) Distal Anastomoses - Vein Harvest Technique: ☐ Endovascular ☐ Direct Vision ☐ Both

Saphenous Vein Harvest Time: \_\_\_\_\_ (minutes)

Anastomotic Device Used: ☐ Yes ☐ No (If Yes →) Anastomotic Device: ☐ Glue ☐ Magnets ☐ Clips ☐ Staples ☐ Other

Internal Mammary Arteries Used for Grafts: ☐ Left IMA ☐ Right IMA ☐ Both IMAs ☐ No IMA If Left, Right, or Both ↓

IMA Harvest Technique: ☐ Direct Vision ☐ Thoracoscopy

☐ Combination ☐ Robotic Assisted

Number of IMA Distal Anastomoses: \_\_\_\_\_

Radial Artery Used: ☐ No Radial ☐ Left Radial ☐ Right Radial ☐ Both Radials If Left, Right, or Both ↓

Number of Radial Artery Distal Anastomoses: \_\_\_\_\_

Radial Distal Anastomoses Harvest Technique: ☐ Endovascular ☐ Direct Vision ☐ Both

Radial Artery Harvest Time: \_\_\_\_\_ (minutes)

Number of Gastro-Epiploic Artery Distal Anastomoses: \_\_\_\_\_

Number of Other Arterial Distal Anastomoses: \_\_\_\_\_

### Valve Surgery (if 18 yrs or older)

Surgical Procedure done on Aortic, Mitral, Tricuspid, or Pulmonic Valves: ☐ Yes ☐ No (If Yes ↓)

#### Aortic Procedure:

No  
Replacement  
Repair/Reconstruction  
Root Reconstruction w/ Valve Conduit  
Replacement + Aortic Graft Conduit  
Root Reconstruction w/ Valve Sparing  
Resuspension Aortic Valve w/  
Replacement Ascending Aorta  
Resuspension Aortic Valve w/o  
Replacement Ascending Aorta  
Resection Sub-Aortic Stenosis

#### Mitral Procedure:

No  
Annuloplasty Only  
Replacement  
Reconstruction w/ Annuloplasty  
Reconstruction w/o Annuloplasty  
↓  
(If Replacement)  
Mitral Repair Attempt: ☐ Yes ☐ No

#### Tricuspid Procedure:

No  
Annuloplasty Only  
Replacement  
Reconstruction w/ Annuloplasty  
Reconstruction w/o Annuloplasty  
Valvectomy

#### Pulmonic Procedure

No  
Replacement  
Reconstruction

Aortic Annular Enlargement: ☐ Yes ☐ No

↓ **Key** M = Mechanical B = Bioprosthesis H = Homograft A = Autograft (Ross) R = Ring/Annuloplasty BA = Band/Annuloplasty

Aortic Prosthesis - Implant Type: None M B H A R BA Implant: \_\_\_\_\_ Size: \_\_\_\_\_

Mitral Prosthesis - Implant Type: None M B H A R BA Implant: \_\_\_\_\_ Size: \_\_\_\_\_

Tricuspid Prosthesis - Implant Type: None M B H A R BA Implant: \_\_\_\_\_ Size: \_\_\_\_\_

Pulmonic Prosthesis - Implant Type: None M B H A R BA Implant: \_\_\_\_\_ Size: \_\_\_\_\_

### Valve Key

#### Mechanical

112 = Carpentier-Edwards PERIMOUNT Theon RSR Pericardial Bioprosthesis



2 = ATS Mechanical Prosthesis  
 3 = Björk-Shiley Convex-Concave Mechanical Prosthesis  
 4 = Björk-Shiley Monostrut Mechanical Prosthesis  
 6 = CarboMedics Mechanical Prosthesis  
 57 = CarboMedics Carbo-Seal Ascending Aortic Valved Conduit Prosthesis  
 58 = CarboMedics Carbo-Seal Valsalva Ascending Aortic Valved Conduit Prosthesis  
 59 = CarboMedics Reduced Cuff Aortic Valve  
 60 = CarboMedics Standard Aortic Valve  
 61 = CarboMedics Top-Hat Supra-annular Aortic Valve  
 62 = CarboMedics OptiForm Mitral Valve  
 63 = CarboMedics Standard Mitral Valve  
 64 = CarboMedics Orbis Universal Valve  
 65 = CarboMedics Small Adult Aortic and Mitral Valves  
 53 = Lillehei-Kaster Mechanical Prosthesis  
 10 = MCRI On-X Mechanical Prosthesis  
 8 = Medtronic-Hall/Hall Easy-Fit Mechanical Prosthesis  
 66 = Medtronic ADVANTAGE Mechanical Prosthesis  
 9 = OmniCarbon Mechanical Prosthesis  
 54 = OmniScience Mechanical Prosthesis  
 11 = Sorin Bicarbon (Baxter Mira) Mechanical Prosthesis  
 12 = Sorin Monoleaflet Allcarbon Mechanical Prosthesis  
 13 = St. Jude Medical Mechanical Heart Valve  
 67 = St. Jude Medical Masters Series Mechanical Heart Valve  
 68 = St. Jude Medical Masters Series Aortic Valve Graft Prosthesis  
 69 = St. Jude Medical Mechanical Heart Valve Hemodynamic Plus (HP) Series  
 70 = St. Jude Medical Masters Series Hemodynamic Plus Valve with FlexCuff Sewing Ring  
 71 = St. Jude Medical Regent Valve  
 14 = Starr-Edwards Caged-Ball Prosthesis  
 15 = Ultracor Mechanical Prosthesis

### **Bioprosthesis**

108 = ATS 3f Aortic Bioprosthesis  
 72 = Edwards Prima Stentless Porcine Bioprosthesis - Subcoronary  
 73 = Edwards Prima Stentless Porcine Bioprosthesis - Root  
 19 = Biocor Porcine Bioprosthesis  
 74 = Biocor Stentless Porcine Bioprosthesis - Subcoronary  
 75 = Biocor Stentless Porcine Bioprosthesis - Root  
 21 = CarboMedics PhotoFix Pericardial Bioprosthesis  
 76 = Carpentier-Edwards Duraflex Porcine Bioprosthesis  
 77 = Carpentier-Edwards Prima Plus Stentless Porcine Bioprosthesis - Subcoronary  
 78 = Carpentier-Edwards Prima Plus Stentless Porcine Bioprosthesis - Root  
 22 = Carpentier-Edwards PERIMOUNT Pericardial Bioprosthesis  
 103 = Carpentier-Edwards PERIMOUNT Pericardial Magna Bioprosthesis  
 23 = Carpentier-Edwards Standard Porcine Bioprosthesis  
 25 = Carpentier-Edwards Supra-Annular Aortic Porcine Bioprosthesis  
 79 = Cryolife O'Brien Stentless Porcine Bioprosthesis - Subcoronary  
 80 = Cryolife O'Brien Stentless Porcine Bioprosthesis - Root

113 = Carpentier-Edwards PERIMOUNT RSR Pericardial Bioprosthesis  
 114 = Carpentier-Edwards PERIMOUNT Theon Pericardial Bioprosthesis  
 115 = Carpentier-Edwards S.A.V. Porcine Bioprosthesis  
 116 = Edwards Prima Plus Stentless Bioprosthesis  
 117 = Carpentier-Edwards PERIMOUNT Plus Pericardial Bioprosthesis with Tricentrix Holder  
 118 = Carpentier-Edwards Duraflex Low Pressure Porcine Bioprosthesis  
 119 = Carpentier-Edwards Duraflex Low Pressure ESR Porcine Bioprosthesis  
 120 = Carpentier-Edwards PERIMOUNT Theon Pericardial Bioprosthesis with Tricentrix Holder.  
 121 = St. Jude Medical Biocor Supra Stented Porcine Bioprosthesis  
 122 = St. Jude Medical Epic Supra Stented Porcine Bioprosthesis.

### **Homograft**

89 = CryoLife Aortic Homograft  
 90 = CryoLife Pulmonary Homograft  
 91 = CryoLife CryoValve SG(Decellularized)Aortic Homograft  
 92 = CryoLife CryoValve SG Pulmonary Homograft  
 41 = Homograft Aortic - Subcoronary  
 42 = Homograft Aortic - Root  
 43 = Homograft Mitral  
 44 = Homograft Pulmonic Root  
 93 = LifeNet CV Allografts

### **Autograft**

45 = Pulmonary Autograft to aortic root (Ross Procedure)

### **Ring/Annuloplasty**

109 = ATS Stimulus Flex-O Ring  
 110 = ATS Stimulus Flex-C Band  
 94 = CarboMedics AnnuloFlo Ring  
 95 = CarboMedics AnnuloFlex Ring  
 96 = CarboMedics CardioFix Bovine Pericardium with PhotoFix Technology  
 46 = Carpentier-Edwards Classic Annuloplasty Ring  
 104 = Carpentier-Edwards Geoform Ring  
 105 = Carpentier-Edwards IMR Etlogix Ring  
 47 = Carpentier-Edwards Physio Annuloplasty System Ring  
 48 = Cosgrove-Edwards Annuloplasty System Ring  
 97 = Edwards MC<sup>3</sup> Tricuspid Annuloplasty System G Future Band  
 98 = Genesee Sculptor Annuloplasty Ring  
 49 = Medtronic Sculptor Ring  
 50 = Medtronic-Duran AnCore Ring  
 51 = Sorin-Puig-Messana Ring  
 52 = St. Jude Medical Séguin Annuloplasty Ring.  
 106 = St. Jude Medical Rigid Saddle Ring  
 99 = St. Jude Medical Tailor Annuloplasty Ring  
 123 = ATS Stimulus Flexible Annuloplasty ring.  
 124 = ATS Stimulus Semi-Rigid Annuloplasty ring  
 125 = Carpentier-Edwards Classic Annuloplasty Ring with DuraFlo Treatment

55 = Hancock Standard Porcine Bioprosthesis  
 28 = Hancock II Porcine Bioprosthesis  
 29 = Hancock Modified Orifice Porcine Bioprosthesis  
 30 = Ionescu-Shiley Pericardial Bioprosthesis  
 31 = Labcor Stented Porcine Bioprosthesis  
 81 = Labcor Stentless Porcine Bioprosthesis - Subcoronary  
 82 = Labcor Stentless Porcine Bioprosthesis - Root  
 83 = Medtronic Freestyle Stentless Porcine Bioprosthesis - Subcoronary  
 84 = Medtronic Freestyle Stentless Porcine Bioprosthesis - Root  
 35 = Medtronic Intact Porcine Bioprosthesis  
 36 = Medtronic Mosaic Porcine Bioprosthesis  
 85 = Medtronic Contegra Bovine Jugular Bioprosthesis  
 37 = Mitroflow Pericardial Bioprosthesis  
 39 = St. Jude Medical Toronto SPV Stentless Porcine Bioprosthesis  
 40 = St. Jude Medical-Bioimplant Porcine Bioprosthesis  
 86 = St. Jude Medical Biocor Stented Tissue Valve  
 87 = St. Jude Medical Epic Stented Porcine Bioprosthesis  
 88 = St. Jude Medical Toronto Root Stentless Porcine Bioprosthesis  
 38 = Sorin Pericarbon Stentless Pericardial Bioprosthesis  
 111 = Carpentier-Edwards PERIMOUNT MAGNA Pericardial Bioprosthesis with Carpentier-Edwards Thermafix Tissue Process

126 = Carpentier-Edwards Physio Annuloplasty Ring with Duraflo Treatment  
 127 = Cosgrove-Edwards Annuloplasty System with Duraflo Treatment  
 128 = Myxo Etlogix Annuloplasty Ring  
 131 = Sorin Memo 3D Ring  
 132 = UNIRING, Universal Annuloplasty System

**Band / Annuloplasty**

100 = Medtronic Colvin Galloway Future Band  
 101 = Medtronic Duran Band  
 102 = Medtronic Duran - Ancore Band  
 107 = St. Jude Medical Tailor Annuloplasty Band

**Other**

777 = Other

#### VAD (if 18 yrs or older)

Ventricular Assist Device Implanted: ☐ Yes ☐ No (If Yes ↓)

Previous VAD: ☐ Yes ☐ No (If Yes →) Implanted at another facility: ☐ Yes ☐ No

References to "Initial VAD" refer to the initial VAD for this hospitalization, not a VAD placed during a previous hospitalization.

#### Current Circulatory Support: For Initial VAD Only

Indication for VAD: ☐ Bridge to Transplantation ☐ Bridge to Recovery ☐ Destination  
☐ Postcardiotomy Ventricular Failure (Separation from CPB) ☐ Device Malfunction ☐ End of Life

Intubated Pre VAD: ☐ Yes ☐ No

Hemodynamics Pre VAD:

PCWP: \_\_\_\_mm/Hg CVP: \_\_\_\_mm/Hg CI: \_\_\_\_L/ (min x m2)  
 RV Function: ☐ Normal ☐ Mildly Impaired ☐ Moderately Impaired ☐ Severely Impaired

#### VAD Device Data:

Implant Type: Fill in below: Right VAD (RVAD) Left VAD (LVAD) BiVentricular BiVAD (BiVAD) Total Artificial Heart (TAH)  
 Product Type: Fill in below: 1. HeartQuest VAD 2. Lion Heart 3. Novacor LVAS 4. Heartsaver VAD 5. Jarvik 2000 6. DeBakey VAD  
 7. TandemHeart pVAD 8. AB-180 iVAD 9. CardioWest TAH 10. Thoratec iVAD 11. HeartMate VE 12. HeartMate IP LVAS  
 13. HeartMate SNAP-VE 14. HeartMate XVE 15. HeartMate II 16. HeartMate III 17. BVS5000i 18. AbioCor 19. InCor  
 20. Excor 22. Abiomed AB 5000 23. Abiomed Impella 24. VentrAssist 25. Circulite LVAD 26. HeartWare – HVAD  
 27. Terumo – DuraHeart LVAD 28. WorldHeart – Levacor LVAD 29. Levitronix – CentriMag 21. Other  
 Explant Reason: Fill in below: 1. Cardiac Transplant 2. Recovery 3. Device Transfer 4. Device Related Infection 5. Device Malfunction 6. End of Life

#### Initial Implant Data

| Implant Type | Product Type | Implant Date                 | Explant                                                  | Explant Date                 | Explant Reason | Transplant Date              |
|--------------|--------------|------------------------------|----------------------------------------------------------|------------------------------|----------------|------------------------------|
| _____        | _____        | ____/____/____<br>mm dd yyyy | <input type="checkbox"/> Yes <input type="checkbox"/> No | ____/____/____<br>mm dd yyyy | _____          | ____/____/____<br>mm dd yyyy |

Initial VAD Cannulation/Attach Site:

LVAD Inflow: ☐ Left Atrium ☐ Left Ventricle  
 RVAD Inflow: ☐ Right Atrium ☐ Right Ventricle

**Additional Implant(s) Data**Second Device Implanted: ☐ Yes ☐ No (If Yes ↓)

| Implant Type #2 | Product Type #2 | Implant Date #2              | Explant #2                                               | Explant Date #2              | Explant Reason #2 | Transplant Date #2           |
|-----------------|-----------------|------------------------------|----------------------------------------------------------|------------------------------|-------------------|------------------------------|
| _____           | _____           | ____/____/____<br>mm dd yyyy | <input type="checkbox"/> Yes <input type="checkbox"/> No | ____/____/____<br>mm dd yyyy | _____             | ____/____/____<br>mm dd yyyy |

Implant #2 VAD Cannulation/Attach Site:

LVAD Inflow: ☐ Left Atrium ☐ Left VentricleRVAD Inflow: ☐ Right Atrium ☐ Right VentricleThird Device Implanted: ☐ Yes ☐ No (If Yes ↓)

| Implant Type #3 | Product Type #3 | Implant Date #3              | Explant #3                                               | Explant Date #3              | Explant Reason #3 | Transplant Date #3           |
|-----------------|-----------------|------------------------------|----------------------------------------------------------|------------------------------|-------------------|------------------------------|
| _____           | _____           | ____/____/____<br>mm dd yyyy | <input type="checkbox"/> Yes <input type="checkbox"/> No | ____/____/____<br>mm dd yyyy | _____             | ____/____/____<br>mm dd yyyy |

Implant #3 VAD Cannulation/Attach Site:

LVAD Inflow: ☐ Left Atrium ☐ Left VentricleRVAD Inflow: ☐ Right Atrium ☐ Right Ventricle

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**Primary VAD Complications Data:**Intracranial Bleed: ☐ Yes ☐ NoEmbolic Stroke: ☐ Yes ☐ NoDriveline and/or Cannula Infection: ☐ Yes ☐ NoPump Pocket Infection: ☐ Yes ☐ NoVAD Endocarditis: ☐ Yes ☐ NoDevice Malfunction: ☐ Yes ☐ NoBowel Obstruction: ☐ Yes ☐ No

Additional Complications (not specific to initial VAD as above) to be collected in Complications.

VAD Discharge Status: ☐ With VAD  
☐ Without VAD  
☐ Expired in hospital (where initial VAD was implanted)