NATIONAL QUALITY FORUM

Measure Evaluation 4.1
December 2009

This form contains the measure information submitted by stewards. Blank fields indicate no information was provided. Attachments also may have been submitted and are provided to reviewers. The subcriteria and most of the footnotes from the evaluation criteria are provided in Word comments within the form and will appear if your cursor is over the highlighted area. Hyperlinks to the evaluation criteria and ratings are provided in each section.

TAP/Workgroup (if utilized)**:** Complete all yellow highlighted areas of the form. Evaluate the extent to which each subcriterion is met. Based on your evaluation, summarize the strengths and weaknesses in each section.

Note: *If there is no TAP or workgroup, the SC also evaluates the subcriteria (yellow highlighted areas).*

Steering Committee: Complete all pink highlighted areas of the form. Review the workgroup/TAP assessment of the subcriteria, noting any areas of disagreement; then evaluate the extent to which each major criterion is met; and finally, indicate your recommendation for the endorsement. Provide the rationale for your ratings.

Evaluation ratings of the extent to which the criteria are met
C = Completely (unquestionably demonstrated to meet the criterion)
P = Partially (demonstrated to partially meet the criterion)
M = Minimally (addressed BUT demonstrated to only minimally meet the criterion)
N = Not at all (NOT addressed; OR incorrectly addressed; OR demonstrated to NOT meet the criterion)
NA = Not applicable (only an option for a few subcriteria as indicated)

(for NQF staff use) **NQF Review #:** 0340 **NQF Project:** Surgery Endorsement Maintenance 2010
MEASURE DESCRIPTIVE INFORMATION
De.1 **Measure Title:** Pediatric Heart Surgery Volume (PDI 7)
De.2 **Brief description of measure:** Number of discharges with procedure for pediatric heart surgery
1.1-2 **Type of Measure:** Structure De.3 **If included in a composite or paired with another measure, please identify composite or paired measure** Pediatric Heart Surgery Mortality (PDI 6) (NQF #0339))
De.4 **National Priority Partners Priority Area:** Population health, Safety De.5 **IOM Quality Domain**: Effectiveness, Safety De.6 **Consumer Care Need:** Getting better

CONDITIONS FOR CONSIDERATION BY NQF	
Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards:	NQF Staff
A. The measure is in the public domain or an intellectual property (measure steward agreement) is signed. *Public domain only applies to governmental organizations. All non-government organizations must sign a measure steward agreement even if measures are made publicly and freely available.* A.1 **Do you attest that the measure steward holds intellectual property rights to the measure and the right to use aspects of the measure owned by another entity (e.g., risk model, code set)?** Yes A.2 **Indicate if Proprietary Measure** (*as defined in measure steward agreement*)**:** A.3 **Measure Steward Agreement:** Government entity and in the public domain - no agreement necessary A.4 **Measure Steward Agreement attached:**	**A** Y☐ N☐
B. The measure owner/steward verifies there is an identified responsible entity and process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every 3 years. Yes, information provided in contact section	**B** Y☐ N☐

C. The intended use of the measure includes both public reporting and quality improvement. ►**Purpose:** Public Reporting, Quality Improvement (Internal to the specific organization)	**C** Y☐ N☐
D. The requested measure submission information is complete. Generally, measures should be fully developed and tested so that all the evaluation criteria have been addressed and information needed to evaluate the measure is provided. Measures that have not been tested are only potentially eligible for a time-limited endorsement and in that case, measure owners must verify that testing will be completed within 12 months of endorsement. D.1**Testing:** Yes, fully developed and tested D.2 **Have NQF-endorsed measures been reviewed to identify if there are similar or related measures?** Yes	**D** Y☐ N☐
(for NQF staff use) **Have all conditions for consideration been met?** **Staff Notes to Steward** (*if submission returned*)**:**	**Met** Y☐ N☐
Staff Notes to Reviewers (*issues or questions regarding any criteria*)**:**	
Staff Reviewer Name(s):	

TAP/Workgroup Reviewer Name:	
Steering Committee Reviewer Name:	
1. IMPORTANCE TO MEASURE AND REPORT	
Extent to which the specific measure focus is important to making significant gains in health care quality (safety, timeliness, effectiveness, efficiency, equity, patient-centeredness) and improving health outcomes for a specific high impact aspect of healthcare where there is variation in or overall poor performance. ***Measures must be judged to be important to measure and report*** *in order to be evaluated against the remaining criteria.* (evaluation criteria) **1a. High Impact**	**Eval Rating**
(for NQF staff use) **Specific NPP goal**:	
1a.1 **Demonstrated High Impact Aspect of Healthcare:** Patient/societal consequences of poor quality 1a.2 1a.3 **Summary of Evidence of High Impact:** Pending update. Using a multivariate model that included age, complexity category, and four comorbidities, Hannan et al. found 8.26% risk-adjusted mortality at hospitals with fewer than 100 cases per year, versus 5.95% at higher volume hospitals (an effect limited to surgeons who performed at least 75 cases per year). [1] For a more complete review of this topic, see: URL:http://www.qualityindicators.ahrq.gov/downloads/pdi/pdi_measures_v31 1a.4 **Citations for Evidence of High Impact:** Updated citations will be presented in the May Steering Committee meeting [1] Hannan EL, Racz M, Kavey RE, Quaegebeur JM, Williams R. Pediatric cardiac surgery: the effect of hospital and surgeon volume on in-hospital mortality. Pediatrics 1998;101(6):963-9	**1a** C☐ P☐ M☐ N☐
1b. Opportunity for Improvement 1b.1 **Benefits (improvements in quality) envisioned by use of this measure:** Higher volume is associated with reduced mortality and morbidity. 1b.2 **Summary of data demonstrating performance gap (variation or overall poor performance) across providers:** The number of pediatric cardiac procedures is measured accurately with discharge data; in fact, discharge data are probably the best available source for hospital volume information. Previous studies suggest that pediatric cardiac surgery is already highly concentrated at a relatively small number of facilities (e.g., 16	**1b** C☐ P☐ M☐ N☐

hospitals in New York, 37 in California and Massachusetts together). Although some of these facilities have very high volumes, a significant number (e.g., 16 hospitals in California and Massachusetts) perform fewer than 10 cases per year. The highly skewed volume distribution may have an adverse effect on the precision of this measure.

1b.3 Citations for data on performance gap:
AHRQ 2007 State Inpatient Databases (SID) with 4,000 hospitals and 30 million adult discharges

1b.4 Summary of Data on disparities by population group:
Across a broad set of 23 quality indicators, findings indicate that racial/ethnic disparities vary by income levels and types of insurance. Key highlights include the finding that racial/ethnic differences within income or insurance/payer groups are more pronounced for some racial/ethnic groups than others. Hispanic children followed by Asian children had worse quality than whites as measured by the majority of quality indicators. Exceptions included rates of admissions for diabetes, admissions for gastroenteritis, accidental puncture during procedures, and decubitus ulcers . Many indicators showed less than ideal quality for all subgroups of children, even whites with private insurance. [1]

References
[1] Berdahl T, Owens PL, Dougherty D, McCormick MC, Pylypchuk Y, Simpson LA. Annual report on health care for children and youth in the United States: racial/ethnic and socioeconomic disparities in children´s health care quality. Acad Pediatr. 2010 Mar-Apr;10(2):95-118. PMID: 20206909.

1b.5 Citations for data on Disparities:
The analyses are based on data from a nationally representative random sample of children in the United States in 2004 and 2005 from the Medical Expenditure Panel Survey (MEPS) and pediatric hospitalizations from a nationwide sample of hospitals in 2005 from the State Inpatient Databases disparities analysis file from the Healthcare Cost and Utilization Project (HCUP). [1]

1c. Outcome or Evidence to Support Measure Focus

1c.1 Relationship to Outcomes (*For non-outcome measures, briefly describe the relationship to desired outcome. For outcomes, describe why it is relevant to the target population*)**:** The measure focus is an structure (volume) that is associated with an outcome (mortality) relevant to a neonatal population with a diagnosis of congenital heart defect or procedure for congenital heart repair.

1c.2-3. Type of Evidence: Expert opinion, Systematic synthesis of research

1c.4 Summary of Evidence (*as described in the criteria; for outcomes, summarize any evidence that healthcare services/care processes influence the outcome*)**:**
Using a multivariate model that included age, complexity category, and four comorbidities, Hannan et al. found 8.26% risk-adjusted mortality at hospitals with fewer than 100 cases per year, versus 5.95% at higher volume hospitals (an effect limited to surgeons who performed at least 75 cases per year). [1] Two other studies using hospital discharge data from California and Massachusetts found similar effects of hospital volume. [2] [3]
Another source of evidence is that cardiopulmonary bypass or aortic crossclamp time has been repeatedly associated with postoperative mortality, adjusting for a variety of patient characteristics.[4-7] This relationship has been demonstrated not just for the Fontan procedure, but also for the Norwood procedure for hypoplastic left heart syndrome. [8] Experienced surgeons and surgical teams should be able to reduce cardiopulmonary bypass or aortic cross-clamp time, thereby improving postoperative mortality.

1c.5 Rating of strength/quality of evidence (*also provide narrative description of the rating and by whom***):**
B there is moderate certainty that the net benefit is moderate to substantial (review by project team)

1c.6 Method for rating evidence: U.S. Preventive Services Task Force (USPSTF) assigns one of five letter grades to each of its recommendations (A, B, C, D, or I).

1c.7 Summary of Controversy/Contradictory Evidence: A study reviewed the application of two case-mix complexity-adjustment tools in the Society of Thoracic Surgeons (STS) Congenital Heart Surgery Database: the Aristotle Basic Complexity (ABC) score and the Risk Adjustment in Congenital Heart Surgery (RACHS-1)

1c
C ☐
P ☐
M ☐
N ☐

method. With both RACHS-1 and ABC, as complexity increases, discharge mortality also ncreases. The ABC approach allows classification of more operations, whereas the RACHS-1 discriminates better at the higher end of complexity. Complexity stratification is a useful method for analyzing the impact of case mix on pediatric cardiac surgical outcomes. Both the RACHS-1 and ABC methods facilitate complexity stratification in the STS database.

1c.8 Citations for Evidence (*other than guidelines*): Updated citations will be presented in the May Steering Committee meeting

[1] Hannan EL, Racz M, Kavey RE, Quaegebeur JM, Williams R. Pediatric cardiac surgery: the effect of hospital and surgeon volume on in-hospital mortality. Pediatrics 1998;101(6):963-9.
[2] Jenkins KJ, Newburger JW, Lock JE, Davis RB, Coffman GA, Iezzoni LI. In-hospital mortality for surgical repair of congenital heart defects: preliminary observations of variation by hospital caseload. Pediatrics 1995;95(3):323-30.
[3] Sollano JA, Gelijns AC, Moskowitz AJ, Heitjan DF, Cullinane S, Saha T, et al. Volume-outcome relationships in cardiovascular operations: New York State, 1990-1995. J Thorac Cardiovasc Surg 1999;117(3):419-28.
[4] Cetta F, Feldt RH, O´Leary PW, Mair DD, Warnes CA, Driscoll DJ, et al. Improved early morbidity and mortality after Fontan operation: the Mayo Clinic experience, 1987 to 1992. J Am Coll Cardiol 1996;28(2):480-6.
[5] Gentles TL, Gauvreau K, Mayer JE, Jr., Fishberger SB, Burnett J, Colan SD, et al. Functional outcome after the Fontan operation: factors influencing late morbidity. J Thorac Cardiovasc Surg 1997;114(3):392-403; discussion 404-5.
[6] Kaulitz R, Ziemer G, Luhmer I, Kallfelz HC. Modified Fontan operation in functionally univentricular hearts: preoperative risk factors and intermediate results. J Thorac Cardiovasc Surg 1996;112(3):658-64.
[7] Fontan F, Kirklin JW, Fernandez G, Costa F, Naftel DC, Tritto F, et al. Outcome after a "perfect" Fontan operation. Circulation 1990;81(5):1520-36.
[8] Kern JH, Hayes CJ, Michler RE, Gersony WM, Quaegebeur JM. Survival and risk factor analysis for the Norwood procedure for hypoplastic left heart syndrome. Am J Cardiol 1997;80(2):170-4.

1c.9 Quote the Specific guideline recommendation (*including guideline number and/or page number*):
Surgery for congenital heart disease, especially in infants, requires a setting that readily meets the complex and special needs of this group of patients. These requirements include a cardiac surgeon experienced in the operative and perioperative management of such patients. There should be a pediatric cardiologist, an anesthesia team, perfusionists, intensive care nurses, and appropriate intensive care facilities for the treatment of infants and children. At a hospital where congenital heart operations are performed, a total of 100 congenital heart operations (both open and closed, not including neonatal ductus ligations) should be done. The occasional management of an infant or child with congenital heart disease by an otherwise busy and well-functioning adult cardiac surgical team is strongly discouraged.

1c.10 Clinical Practice Guideline Citation: http://www.facs.org/fellows_info/guidelines/cardiac.html
1c.11 National Guideline Clearinghouse or other URL: Not Applicable.

1c.12 Rating of strength of recommendation (*also provide narrative description of the rating and by whom*):
Not Applicable.

1c.13 Method for rating strength of recommendation (*If different from USPSTF system, also describe rating and how it relates to USPSTF)*:
Not Applicable.

1c.14 Rationale for using this guideline over others:
No competing measures found.

TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Importance to Measure and Report?*	**1**
Steering Committee: Was the threshold criterion, *Importance to Measure and Report*, met? **Rationale:**	**1** **Y☐** **N☐**

2. SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES	
Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (evaluation criteria)	Eval Rating
2a. MEASURE SPECIFICATIONS	
S.1 Do you have a web page where current detailed measure specifications can be obtained? **S.2 If yes, provide web page URL:** **2a. Precisely Specified**	
2a.1 Numerator Statement (*Brief, text description of the numerator - what is being measured about the target population, e.g. target condition, event, or outcome***):** Discharges under age 18 with ICD-9-CM procedure codes for either congenital heart disease (1P) in any field or non-specific heart surgery (2P) with ICD-9-CM diagnosis of congenital heart disease (2D) in any field. **2a.2 Numerator Time Window (***The time period in which cases are eligible for inclusion in the numerator***):** Time window can be determined by user, but is generally a calendar year. **2a.3 Numerator Details (***All information required to collect/calculate the numerator, including all codes, logic, and definitions***):** Discharges under age 18 with ICD-9-CM procedure codes for either congenital heart disease (1P) or non-specific heart surgery (2P) with ICD-9-CM diagnosis of congenital heart disease (2D) in any field. Congenital heart disease procedures (1P): 3500 CLOSED VALVOTOMY NOS 3501 CLOSED AORTIC VALVOTOMY 3502 CLOSED MITRAL VALVOTOMY 3503 CLOSED PULMON VALVOTOMY 3504 CLOSED TRICUSP VALVOTOMY 3510 OPEN VALVULOPLASTY NOS 3511 OPN AORTIC VALVULOPLASTY 3512 OPN MITRAL VALVULOPLASTY 3513 OPN PULMON VALVULOPLASTY 3514 OPN TRICUS VALVULOPLASTY 3520 REPLACE HEART VALVE NOS 3521 REPLACE AORT VALV-TISSUE 3522 REPLACE AORTIC VALVE NEC 3523 REPLACE MITR VALV-TISSUE 3524 REPLACE MITRAL VALVE NEC 3525 REPLACE PULM VALV-TISSUE	**2a-specs** C☐ P☐ M☐ N☐

3526
REPLACE PULMON VALVE NEC
3527
REPLACE TRIC VALV-TISSUE
3528
REPLACE TRICUSP VALV NEC
3531
PAPILLARY MUSCLE OPS
3532
CHORDAE TENDINEAE OPS
3533
ANNULOPLASTY
3534
INFUNDIBULECTOMY
3535
TRABECUL CARNEAE CORD OP
3539
TISS ADJ TO VALV OPS NEC
3541
ENLARGE EXISTING SEP DEF
3542
CREATE SEPTAL DEFECT
3550
PROSTH REP HRT SEPTA NOS
3551
PROS REP ATRIAL DEF-OPN
3552
PROS REPAIR ATRIA DEF-CL
3553
PROST REPAIR VENTRIC DEF
3554
PROS REP ENDOCAR CUSHION
3560
GRFT REPAIR HRT SEPT NOS
3561
GRAFT REPAIR ATRIAL DEF
3562
GRAFT REPAIR VENTRIC DEF
3563
GRFT REP ENDOCAR CUSHION
3570
HEART SEPTA REPAIR NOS
3571
ATRIA SEPTA DEF REP NEC
3572
VENTR SEPTA DEF REP NEC
3573
ENDOCAR CUSHION REP NEC
3581
TOT REPAIR TETRAL FALLOT
3582
TOTAL REPAIR OF TAPVC
3583
TOT REP TRUNCUS ARTERIOS
3584
TOT COR TRANSPOS GRT VES
3591
INTERAT VEN RETRN TRANSP

3592
CONDUIT RT VENT-PUL ART
3593
CONDUIT LEFT VENTR-AORTA
3594
CONDUIT ARTIUM-PULM ART
3595
HEART REPAIR REVISION
3598
OTHER HEART SEPTA OPS
3599
OTHER OP ON HRT VALVES
3699
OTHER OPERATIONS ON VESSEL OF HEART
3733
EXCISION OR DESTRUCTION OF OTHER LESION OR TISSUE OF HEART
3736
EXCISION OR DESTRUCTION OF LEFT ATRIAL APPENDAGE (LAA) OCT08-
375
HEART TRANSPLANTATION (invalid as of OCT03)
3751
HEART TRANSPLANTATION OCT03-
3752
IMPLANT TOT REP HRT SYS OCT03-
390
SYSTEMIC-PULM ART SHUNT
3921
CAVAL-PULMON ART ANASTOM

Non-specific cardiac procedures (2P):
3834
RESECTION OF ABDOMINAL AORTA WITH ANASTOMOSIS
3835
THOR VESSEL RESECT/ANAST
3844
RESECTION OF ABDOMINAL AORTA WITH REPLACEMENT
3845
RESECT THORAC VES W REPL
3864
OTHER EXCISION OF ABDOMINAL AORTA
3865
OTHER EXCISION OF THORACIC VESSEL
3884
OTHER SURGICAL OCCLUSION OF ABDOMINAL AORTA
3885
OCCLUDE THORACIC VES NEC
3949
OTHER REVISION OF VASCULAR PROCEDURE
3956
REPAIR OF BLOOD VESSEL WITH TISSUE PATCH GRAFT
3957
REPAIR OF BLOOD VESSEL WITH SYNTHETIC PATCH GRAFT
3958
REPAIR OF BLOOD VESSEL WITH UNSPECIFIED TYPE OF PATCH GRAFT
3959
REPAIR OF VESSEL NEC

Congenital heart disease diagnoses (2D):

7450
COMMON TRUNCUS
74510
COMPL TRANSPOS GREAT VES
74511
DOUBLE OUTLET RT VENTRIC
74512
CORRECT TRANSPOS GRT VES
74519
TRANSPOS GREAT VESS NEC
7452
TETRALOGY OF FALLOT
7453
COMMON VENTRICLE
7454
VENTRICULAR SEPT DEFECT
7455
SECUNDUM ATRIAL SEPT DEF
74560
ENDOCARD CUSHION DEF NOS
74561
OSTIUM PRIMUM DEFECT
74569
ENDOCARD CUSHION DEF NEC
7457
COR BILOCULARE
7458
SEPTAL CLOSURE ANOM NEC
7459
SEPTAL CLOSURE ANOM NOS
74600
PULMONARY VALVE ANOM NOS
74601
CONG PULMON VALV ATRESIA
74602
CONG PULMON VALVE STENOS
74609
PULMONARY VALVE ANOM NEC
7461
CONG TRICUSP ATRES/STEN
7462
EBSTEIN'S ANOMALY
7463
CONG AORTA VALV STENOSIS
7464
CONG AORTA VALV INSUFFIC
7465
CONGEN MITRAL STENOSIS
7466
CONG MITRAL INSUFFICIENC
7467
HYPOPLAS LEFT HEART SYND
74681
CONG SUBAORTIC STENOSIS
74682
COR TRIATRIATUM
74683
INFUNDIB PULMON STENOSIS

74684
OBSTRUCT HEART ANOM NEC
74685
CORONARY ARTERY ANOMALY
74687
MALPOSITION OF HEART
74689
CONG HEART ANOMALY NEC
7469
CONG HEART ANOMALY NOS
7470
PATENT DUCTUS ARTERIOSUS
74710
COARCTATION OF AORTA
74711
INTERRUPT OF AORTIC ARCH
74720
CONG ANOM OF AORTA NOS
74721
ANOMALIES OF AORTIC ARCH
74722
AORTIC ATRESIA/STENOSIS
74729
CONG ANOM OF AORTA NEC
7473
PULMONARY ARTERY ANOM
74740
GREAT VEIN ANOMALY NOS
74741
TOT ANOM PULM VEN CONNEC
74742
PART ANOM PULM VEN CONN
74749
GREAT VEIN ANOMALY NEC

Exclude cases:
• MDC 14 (pregnancy, childbirth and pueperium)
• with transcatheter interventions (either 3AP, 3BP, 3CP, 3DP, 3EP with 3D, or 3FP) as single cardiac procedures, performed without bypass (5P) but with catheterization (6P);
• with septal defects (4P) as single cardiac procedures without bypass (5P)

Transcatheter interventions procedure codes:

Closed heart valvotomy (3AP):
3500
CLOSED HEART VALVOTOMY, UNSPECIFIED VALUE
3501
CLOSED HEART VALVOTOMY, AORTIC VALUE
3502
CLOSED HEART VALVOTOMY, MITRAL VALUE
3503
CLOSED HEART VALVOTOMY, PULMONARY VALUE
3504
CLOSED HEART VALVOTOMY, TRICUSPID VALUE

Atrial septal enlargement (3BP):
3541
ENLARGEMENT OF EXISTING ATRIAL SEPTAL DEFECT

3542
CREATION OF SEPTAL DEFECT IN HEART

Atrial septal defect repair (3CP):
3551
REPAIR OF ATIAL SEPTAL DEFECT WITH PROSTHESIS, OPEN TECHNIQUE
3571
OTHER AND UNSPECIFIED REPAIR OF ATRIAL SEPTAL DEFECT

Ventricular septal defect repair (3DP):
3553
REPAIR OF VENTRICULAR SEPTAL DEFECT WITH PROSTHESIS
3572
OTHER AND UNSPECIFIED REPAIR OF VENTRICULAR SEPTAL DEFECT

Occlusion of thoracic vessel (3EP):
3885
OCCLUDE THORACIC VES NEC

PDA closure diagnosis code (3D):
7470
PATENT DUCTUS ARTERIOSUS

Other surgical occlusion (3FP):
3884
OTHER SURGICAL OCCLUSION OF AORTA, ABDOMINAL
3885
OTHER SURGICAL OCCLUSION OF THORACIC VESSEL
3959
OTHER REPAIR OF VESSEL

Extracorporeal circulation (5P):
3961
EXTRACORPOREAL CIRCULAT

Catheterization (6P):
3721
RT HEART CARDIAC CATH
3722
LEFT HEART CARDIAC CATH
3723
RT/LEFT HEART CARD CATH
8842
CONTRAST AORTOGRAM
8843
CONTR PULMON ARTERIOGRAM
8844
ARTERIOGRAPHY OF OTHER INTRATHORACIC VESSELS
8850
ANGIOCARDIOGRAPHY, NOT OTHERWISE SPECIFIED
8851
ANGIOCARDIOGRAPHY OF VENAE CAVAE
8852
ANGIOCARDIOGRAPHY OF RIGHT HEART STRUCTURES
8853
ANGIOCARDIOGRAPHY OF LEFT HEART STRUCTURES
8854
COMBINED RIGHT AND LEFT HEART ANGIOCARDIOGRAPHY

8855
CORONARY ARTERIOGRAPHY USING A SINGLE CATHETER
8856
CORONARY ARTERIOGRAPHY USING TWO CATHETERS
8857
OTHER AND UNSPECIFIED CORONARY ARTERIOGRAPHY
8858
NEGATIVE-CONTRAST CARDIAC ROENTGENOGRAPHY

Atrial septal defect repair and enlargement (4P):
3541
ENLARGE EXISTING SEP DEF
3552
PROS REPAIR ATRIA DEF-CL

2a.4 **Denominator Statement (***Brief, text description of the denominator - target population being measured***):**
This measure does not have a denominator due to the fact it is a volume measure.

2a.5 **Target population gender:** Female, Male
2a.6 **Target population age range:** Age less than 18 years

2a.7 **Denominator Time Window (***The time period in which cases are eligible for inclusion in the denominator***):**
Not applicable

2a.8 **Denominator Details (***All information required to collect/calculate the denominator - the target population being measured - including all codes, logic, and definitions***):**
Not applicable

2a.9 **Denominator Exclusions (***Brief text description of exclusions from the target population***):** Not applicable. This measure does not have a denominator due to the fact it is a volume measure.

2a.10 **Denominator Exclusion Details (***All information required to collect exclusions to the denominator, including all codes, logic, and definitions***):**
Not applicable. This measure does not have a denominator due to the fact it is a volume measure.

2a.11 **Stratification Details/Variables (***All information required to stratify the measure including the stratification variables, all codes, logic, and definitions***):**
Not applicable

2a.12-13 **Risk Adjustment Type:** No risk adjustment necessary

2a.14 **Risk Adjustment Methodology/Variables (***List risk adjustment variables and describe conceptual models, statistical models, or other aspects of model or method***):**
Not applicable

2a.15-17 **Detailed risk model available Web page URL or attachment:**

2a.18-19 **Type of Score:** Count
2a.20 **Interpretation of Score:** Better quality = Higher score
2a.21 **Calculation Algorithm (***Describe the calculation of the measure as a flowchart or series of steps***):**
The volume is the number of discharges with a procedure for pediatric heart surgery.

2a.22 **Describe the method for discriminating performance** *(e.g., significance testing)***:**
Not applicable

2a.23 **Sampling (Survey) Methodology** *If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate)*:
Not applicable

2a.24 **Data Source (***Check the source(s) for which the measure is specified and tested)*

Administrative claims

2a.25 **Data source/data collection instrument (***Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.***):**
The data source is hospital discharge data such as the HCUP State Inpatient Databases (SID) or equivalent using UB-04 coding standards. The data collection instrument is public-use AHRQ QI software available in SAS or Windows versions.

2a.26-28 **Data source/data collection instrument reference web page URL or attachment:** URL None
http://www.qualityindicators.ahrq.gov/software.htm

2a.29-31 **Data dictionary/code table web page URL or attachment:** URL None
http://www.qualityindicators.ahrq.gov/downloads/winqi/AHRQ_QI_Windows_Software_Documentation_V41a.pdf

2a.32-35 **Level of Measurement/Analysis** (*Check the level(s) for which the measure is specified and tested)*
Facility

2a.36-37 **Care Settings (***Check the setting(s) for which the measure is specified and tested)*
Hospital/Acute Care Facility

2a.38-41 **Clinical Services** (*Healthcare services being measured, check all that apply*)
Clinicians: Physicians (MD/DO)

TESTING/ANALYSIS

2b. Reliability testing

2b.1 **Data/sample** *(description of data/sample and size)*: AHRQ 2007 State Inpatient Databases (SID) with 4,000 hospitals and 30 million adult discharges

2b.2 **Analytic Method** *(type of reliability & rationale, method for testing)*:
Literature review, clinical panels and empirical analysis

2b.3 **Testing Results** *(reliability statistics, assessment of adequacy in the context of norms for the test conducted)*:
Pediatric heart surgery procedure codes are based on physician documentation; no evidence has been suggested that these codes are not reliably reported.

2b
C☐
P☐
M☐
N☐

2c. Validity testing

2c.1 **Data/sample** *(description of data/sample and size)*: AHRQ 2007 State Inpatient Databases (SID) with 4,000 hospitals and 30 million adult discharges

2c.2 **Analytic Method** *(type of validity & rationale, method for testing)*:
Literature review, clinical panels and empirical analysis

2c.3 **Testing Results** *(statistical results, assessment of adequacy in the context of norms for the test conducted)*:
Volume is not a direct measure of the quality or outcomes of care. Although higher volumes have been repeatedly associated with better outcomes after pediatric cardiac surgery, these findings may be limited by inadequate risk adjustment.
Only one study used prospectively collected clinical data to estimate the association between hospital volume and mortality following pediatric cardiac surgery.(55) Hannan et al. ordered all cardiac surgical procedures by their actual mortality rates in the 1992-95 Cardiac Surgery Reporting System database. Expert clinicians then grouped the procedures into four clinically sensible subgroups, designed to achieve maximal separation of crude mortality rates (from 1.4% for Category I to 20.1% for Category IV). A multivariate model that included age, complexity category, and four comorbidities (preoperative cyanosis or hypoxia, barotrauma, pulmonary hypertension, major extracardiac anomalies) achieved excellent calibration and discrimination (c=0.818).

2c
C☐
P☐
M☐
N☐

Using this model to estimate risk-adjusted mortality, Hannan et al. found a statistically significant hospital effect (8.26% risk-adjusted mortality at hospitals with fewer than 100 cases per year, versus 5.95% at higher volume hospitals), which was limited to surgeons who performed at least 75 cases per year. Lower volume surgeons experienced relatively high mortality, regardless of total hospital volume. Risk-adjusted mortality differed between low and high-volume hospitals for all 4 complexity categories, although the smallest difference occurred for the highest risk procedures.
Two other studies using hospital discharge data found similar effects of hospital volume. Using aggregated data from California (1988) and Massachusetts (1989), Jenkins et al.(54) estimated risk-adjusted mortality rates of 8.35% and 5.95% at low-volume (100 or fewer cases) and high-volume (more than 100 cases), respectively. However, they also demonstrated especially high risk-adjusted mortality (18.5%) at very low-volume hospitals with fewer than 10 annual cases, and especially low mortality (3.0%) at very high-volume hospitals with more than 300 annual cases. Jenkins et al. could not evaluate the impact of surgeon volume, but they did report stronger volume effects for higher-risk procedures (e.g., OR=12.1 and 3.2 for Category III-IV procedures at hospitals with <10 and 10-100 annual cases, versus OR=2.4 for Category I-II procedures at hospitals with 10-100 annual cases). Finally, Sollano et al. (Sollano, Gelijns et al. 1999) applied the same 4-category risk adjustment procedure developed by Jenkins to hospital discharge data from New York State in 1990-95. They reported a modest but statistically significant effect (OR=0.944 for each additional 100 annual cases), which was limited to neonates (OR=0.636) and post-neonatal infants (OR=0.720) in stratified analyses. Although volume-outcome associations have been demonstrated for pediatric cardiac surgery, volume seems likely to both insensitive and nonspecific as a measure of quality. In addition, pediatric cardiac care is already regionalized, so most procedures are performed in medium-to-high volume hospitals. It has been estimated that shifting patients in California from low-volume to high-volume hospitals would avert only 7 deaths per year.(65)

2d. Exclusions Justified

2d.1 Summary of Evidence supporting exclusion(s):
Exclusions remove cases where the outcome of interest is less likely to be preventable or more likely to be preventable or with no or very low risk.

2d.2 Citations for Evidence:
Updated citations will be presented in the May Steering Committee meeting

Jenkins KJ, Newburger JW, Lock JE, Davis RB, Coffman GA, Iezzoni LI. In-hospital mortality for surgical repair of congenital heart defects: preliminary observations of variation by hospital caseload. Pediatrics 1995;95(3):323-30.

2d.3 Data/sample *(description of data/sample and size)*: Not applicable

2d.4 Analytic Method *(type analysis & rationale)*:
Not applicable

2d.5 Testing Results *(e.g., frequency, variability, sensitivity analyses)*:
Not applicable

2d
C☐
P☐
M☐
N☐
NA☐

2e. Risk Adjustment for Outcomes/ Resource Use Measures

2e.1 Data/sample *(description of data/sample and size)*: Not applicable

2e.2 Analytic Method *(type of risk adjustment, analysis, & rationale)*:
Not applicable

2e.3 Testing Results *(risk model performance metrics)*:
Not applicable

2e.4 If outcome or resource use measure is not risk adjusted, provide rationale: Not applicable

2e
C☐
P☐
M☐
N☐
NA☐

2f. Identification of Meaningful Differences in Performance

2f.1 Data/sample from Testing or Current Use *(description of data/sample and size)*: AHRQ 2007 State

2f
C☐
P☐

Inpatient Databases (SID) with 4,000 hospitals and 30 million adult discharges **2f.2 Methods to identify statistically significant and practically/meaningfully differences in performance** *(type of analysis & rationale)*: Descriptive analysis **2f.3 Provide Measure Scores from Testing or Current Use** *(description of scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningfully differences in performance)*: The number of pediatric cardiac procedures is measured accurately with discharge data. In fact, discharge data are probably the best available source for hospital volume information. Previous studies suggest that pediatric cardiac surgery is already highly concentrated at a relatively small number of facilities (e.g., 16 hospitals in New York, 37 in California and Massachusetts together). Although some of these facilities have very high volumes, a significant number (e.g., 16 hospitals in California and Massachusetts) perform fewer than 10 cases per year. The highly skewed volume distribution may have an adverse effect on the precision of this measure.	M☐ N☐
2g. Comparability of Multiple Data Sources/Methods **2g.1 Data/sample** *(description of data/sample and size)*: Not applicable **2g.2 Analytic Method** *(type of analysis & rationale)*: Not applicable **2g.3 Testing Results** *(e.g., correlation statistics, comparison of rankings)*: Not applicable	**2g** C☐ P☐ M☐ N☐ NA ☐
2h. Disparities in Care **2h.1 If measure is stratified, provide stratified results** *(scores by stratified categories/cohorts)*: Not applicable **2h.2 If disparities have been reported/identified, but measure is not specified to detect disparities, provide follow-up plans:** Not applicable	**2h** C☐ P☐ M☐ N☐ NA ☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Scientific Acceptability of Measure Properties?*	**2**
Steering Committee: Overall, to what extent was the criterion, *Scientific Acceptability of Measure Properties*, met? **Rationale:**	**2** C ☐ P ☐ M ☐ N ☐
3. USABILITY	
Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. (evaluation criteria)	Eval Rating
3a. Meaningful, Understandable, and Useful Information **3a.1 Current Use:** In use **3a.2 Use in a public reporting initiative (disclosure of performance results to the public at large)** (*If used in a public reporting initiative, provide name of initiative(s), locations, Web page URL(s). If not publicly reported, state the plans to achieve public reporting within 3 years*): Florida (state)	**3a** C☐ P☐ M☐ N☐

Florida Health Finder
http://www.floridahealthfinder.gov/

Illinois (state hospital association)
Illinois Hospitals Caring for You
www.illinoishospitals.org

Kentucky (Norton Healthcare, a hospital system)
Norton Healthcare Quality Report
http://www.nortonhealthcare.com/body.cfm?id=157

Texas (state)
Reports on Hospital Performance
http://www.dshs.state.tx.us/thcic/

Vermont (state)
Dept of Banking, Insurance, Securities & Health Care Administration Comparison Report
http://www.bishca.state.vt.us/health-care/hospitals-health-care-practitioners/2009-vermont-hospital-report-card

The measure is also reported on HCUPnet:
http://hcupnet.ahrq.gov/HCUPnet.jsp?Id=EB57801381F71C41&Form=MAINSEL&JS=Y&Action=%3E%3ENext%3E%3E&_MAINSEL=AHRQ%20Quality%20Indicators

This measure will appear in the MONAHRQ system that is provided for public reporting and quality improvement throughout the United States: http://monahrq.ahrq.gov/

3a.3 **If used in other programs/initiatives (***If used in quality improvement or other programs/initiatives, name of initiative(s), locations, Web page URL(s). If not used for QI, state the plans to achieve use for QI within 3 years***):**
University Healthcare Consortium (UHC) - An alliance of 103 academic medical centers and 219 of their affiliated hosptials. UCH reports the AHRQ QIs to their member hospitals. (See www.uhc.edu. Note that meaure results are reported to hospitals; not reported on the UHC site).

National Association of Children´s Hospitals and Related Institutions (NACHRI) reports all provider level PDIs to its approximately 85 member children´s hospitals. (See http://www.childrenshospitals.net. Note that meaure results are reported to hospitals; not reported on the NACHRI site).

Norton Healthcare - a multi-hospital system in Kentucky (see http://www.nortonhealthcare.com/about/Our_Performance/index.aspx)

Ministry Health Care - a multi-hospital system in Wisconsin (see http://ministryhealth.org/display/router.aspx. Note: measure results reported to hospitals; not reported on site).

Child Health Corporation of America (CHCA) reports all PDIs to its 42 member hospitals, which are large freestanding pediatric hospitals. (See http://www.chca.com/. Note that meaure results are reported to hospitals; not reported on the CHCA site).

This measure will be added to the MONAHRQ system that is provided for public reporting and quality improvement throughout the United States: http://monahrq.ahrq.gov/

Testing of Interpretability (*Testing that demonstrates the results are understood by the potential users for public reporting and quality improvement*)
3a.4 **Data/sample** *(description of data/sample and size)***:** AHRQ 2007 State Inpatient Databases (SID) with 4,000 hospitals and 30 million adult discharges

3a.5 Methods *(e.g., focus group, survey, QI project)*: A research team from the School of Public Affairs, Baruch College, under contracts with the Department of Public Health, Weill Medical College and Battelle, Inc., has developed a pair of Hospital Quality Model Reports at the request of the Agency for Healthcare Research & Quality (AHRQ). These reports are designed specifically to report comparative information on hospital performance based on the AHRQ Quality Indicators (QIs). The work was done in close collaboration with AHRQ staff and the AHRQ Quality Indicators team. The Model Reports (discussed immediately above) are based on: • Extensive search and analysis of the literature on hospital quality measurement and reporting, as well as public reporting on health care quality more broadly; • Interviews with quality measurement and reporting experts, purchasers, staff of purchasing coalitions, and executives of integrated health care delivery systems who are responsible for quality in their facilities; • Two focus groups with chief medical officers of hospitals and/or systems and two focus groups with quality managers from a broad mix of hospitals; • Four focus groups with members of the public who had recently experienced a hospital admission; and • Four rounds of cognitive interviews (a total of 62 interviews) to test draft versions of the two Model Reports with members of the public with recent hospital experience, basic computer literacy but widely varying levels of education **3a.6 Results** *(qualitative and/or quantitative results and conclusions)*: Given the above review of the literature and original research that was conducted, a Model report was the result that could help sponsors use the best evidence on public reports so they are most likely to have the desired effects on quality	
3b/3c. Relation to other NQF-endorsed measures **3b.1 NQF # and Title of similar or related measures:**	
(for NQF staff use) **Notes on similar/related endorsed or submitted measures:**	
3b. Harmonization If this measure is related to measure(s) already endorsed by NQF (e.g., same topic, but different target population/setting/data source or different topic but same target population): **3b.2 Are the measure specifications harmonized? If not, why?**	**3b** C☐ P☐ M☐ N☐ NA ☐
3c. Distinctive or Additive Value **3c.1 Describe the distinctive, improved, or additive value this measure provides to existing NQF-endorsed measures:** **5.1 If this measure is similar to measure(s) already endorsed by NQF (i.e., on the same topic and the same target population), Describe why it is a more valid or efficient way to measure quality:** No competing measures found.	**3c** C☐ P☐ M☐ N☐ NA ☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Usability?*	**3**
Steering Committee: Overall, to what extent was the criterion, *Usability*, met? **Rationale:**	**3** C☐ P☐ M☐ N☐
4. FEASIBILITY	
Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)	Eval Rating
4a. Data Generated as a Byproduct of Care Processes	**4a** C☐

4a.1-2 **How are the data elements that are needed to compute measure scores generated?** Coding/abstraction performed by someone other than person obtaining original information (E.g., DRG, ICD-9 codes on claims, chart abstraction for quality measure or registry)	P☐ M☐ N☐
4b. Electronic Sources 4b.1 **Are all the data elements available electronically?** (*elements that are needed to compute measure scores are in defined, computer-readable fields, e.g., electronic health record, electronic claims*) Yes 4b.2 **If not, specify the near-term path to achieve electronic capture by most providers.**	4b C☐ P☐ M☐ N☐
4c. Exclusions 4c.1 **Do the specified exclusions require additional data sources beyond what is required for the numerator and denominator specifications?** No 4c.2 **If yes, provide justification.**	4c C☐ P☐ M☐ N☐ NA ☐
4d. Susceptibility to Inaccuracies, Errors, or Unintended Consequences 4d.1 **Identify susceptibility to inaccuracies, errors, or unintended consequences of the measure and describe how these potential problems could be audited. If audited, provide results.** Coding professionals follow detail guidelines, are subject to training and credentialing requirements, peer review and audit	4d C☐ P☐ M☐ N☐
4e. Data Collection Strategy/Implementation 4e.1 **Describe what you have 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:** None 4e.2 **Costs to implement the measure** (*costs of data collection, fees associated with proprietary measures*)**:** Administrative data are collected as part of the routine operations. Some staff time is required to download and execute the software from the AHRQ webs site, which is available at no cost. The software for calculating the measure is available for free at: http://www.qualityindicators.ahrq.gov/software.htm 4e.3 **Evidence for costs:** All data necessary to calculate this measure are routinely collected for hospital administrative purposes. The software for calculating the measure is available for free at: http://www.qualityindicators.ahrq.gov/software.htm 4e.4 **Business case documentation:** All data necessary to calculate this measure are routinely collected for hospital administrative purposes. The software for calculating the measure is available for free at: http://www.qualityindicators.ahrq.gov/software.htm	4e C☐ P☐ M☐ N☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Feasibility?*	4
Steering Committee: Overall, to what extent was the criterion, *Feasibility*, met? **Rationale:**	4 C☐ P☐ M☐ N☐
RECOMMENDATION	
(for NQF staff use) **Check if measure is untested and only eligible for time-limited endorsement.**	Time-limit

	ed ☐
Steering Committee: Do you recommend for endorsement? **Comments:**	Y☐ N☐ A☐

CONTACT INFORMATION

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Co.6 Additional organizations that sponsored/participated in measure development
UC Davis,
Stanford University,
Battelle Memorial Institute

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development
Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.
None

Ad.2 If adapted, provide name of original measure: None
Ad.3-5 If adapted, provide original specifications URL or attachment

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.6 Year the measure was first released: 2001
Ad.7 Month and Year of most recent revision: 10, 2010
Ad.8 What is your frequency for review/update of this measure? Annual
Ad.9 When is the next scheduled review/update for this measure? 05, 2011

Ad.10 Copyright statement/disclaimers: The AHRQ QI software is publicly available; no copyright disclaimers.

Ad.11 -13 Additional Information web page URL or attachment:

Date of Submission (*MM/DD/YY*)**:** 06/14/2011