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 #:** 0339 **NQF Project:** Surgery Endorsement Maintenance 2010
MEASURE DESCRIPTIVE INFORMATION
De.1 **Measure Title:** RACHS-1 Pediatric Heart Surgery Mortality
De.2 **Brief description of measure:** Risk-adjusted rate of in-hospital death for pediatric cases undergoing surgery for congenital heart disease, along with ratio of observed to expected in-hospital mortality rates.
1.1-2 **Type of Measure:** Outcome De.3 **If included in a composite or paired with another measure, please identify composite or paired measure** None
De.4 **National Priority Partners Priority Area:** Population health, Safety De.5 **IOM Quality Domain**: Effectiveness 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	**B** Y☐

every 3 years. Yes, information provided in contact section	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:** Congenital heart defects engender major risks for death and lifelong disability. Despite recent advances, these conditions remain the most frequent types of birth defect, resulting in the highest mortality risk from birth defects in infancy, and are the leading medical cause of death in children until adolescence [1-3]. According to Odegard et al [4] despite advances in perioperative care, including monitoring and drugs, unexpected cardiac arrest remains a significant hazard during anesthesia [5-8]. Anesthesia-related morbidity and mortality is more frequent in children than in adults, and is more frequent in infants and younger children than in older children [5,7,8,10-14]. 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). [15] For additional material on this topic, see: URL:http://www.qualityindicators.ahrq.gov/downloads/pdi/pdi_measures_v31.pdf 1a.4 **Citations for Evidence of High Impact:** [1] Fyler DC. Nadas´ Pediatric Cardiology. Philadelphia, PA: Hanley & Belfus, Inc; 1992. [2] Yang Q, Khoury MJ, Mannino D. Trends and patterns of mortality associated with birth defects and genetic	1a C☐ P☐ M☐ N☐

diseases in the United States, 1979-1992: an analysis of multiple-cause mortality data. Genetic Epidemiology 1997; 14(5):493-505.
[3] Zopf PE, Jr. Mortality Patterns and Trends in the United States. Westport, CT: Greenwood Press; 1992.
[4] Odegard KC, DiNardo JA, Kussman BD, Shukla A, Harrington J, Casta A, McGowan FX Jr, Hickey PR, Bacha EA, Thiagarajan RR, Laussen PC. The frequency of anesthesia-related cardiac arrests in patients with congenital heart disease undergoing cardiac surgery. Anesth Analg. 2007 Aug;105(2):335-43. PMID: 17646487
[5] Cohen MM, Cameron CB, Duncan PG. Pediatric anesthesia morbidity and mortality in the perioperative period. Anesth Analg 1990;70:160–7Abstract/FREE Full Text2.
[6] Keenan RL, Boyan CP. Cardiac arrest due to anesthesia. A study of incidence and causes. JAMA 1985;253:2373–7Abstract/FREE Full Text3.
[7] Morray JP, Geiduschek JM, Ramamoorthy C, Haberkern CM, Hackel A, Caplan RA, Domino KB, Posner K, Cheney FW. Anesthesia-related cardiac arrest in children: initial findings of the Pediatric Perioperative Cardiac Arrest (POCA) Registry. Anesthesiology 2000;93:6–14Medline4.
[8] Olsson GL, Hallen B. Cardiac arrest during anaesthesia. A computer-aided study in 250,543 anaesthetics. Acta Anaesthesiol Scand 1988;32:653–64Medline5.
[9] Posner KL, Geiduschek J, Haberkern CM, Ramamoorthy C, Hackel A, Morray JP. Unexpected cardiac arrest among children during surgery: a North American registry to elucidate the incidence and causes of anesthesia related cardiac arrest. Qual Saf Health Care 2002;11:252–7Medline6.
[10] Morray JP. Anesthesia-related cardiac arrest in children. An update. Anesthesiol Clin North America 2002;20:1–287.
[11] Rackow H, Salanitre E, Green LT. Frequency of cardiac arrest associated with anesthesia in infants and children. Pediatrics 1961;28:697–704Medline8.?
[12] Murat I, Constant I, Maud´huy H. Perioperative anaesthetic morbidity in children: a database of 24,165 anaesthetics over a 30-month period. Paediatr Anaesth 2004;14:158–66CrossRefMedline9.
[13] Tay CL, Tan GM, Ng SB. Critical incidents in paediatric anaesthesia: an audit of 10 000 anaesthetics in Singapore. Paediatr Anaesth 2001;11:711–18Medline10.
[14] Braz LG, Modolo NS, do Nascimento P Jr, Bruschi BA, Castiglia YM, Ganem EM, de Carvalho LR, Braz JR. Perioperative cardiac arrest: a study of 53,718 anaesthetics over 9 yr from a Brazilian teaching hospital. Br J Anaesth 2006;96:569–75Abstract/FREE Full Text
[15] 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

1b. Opportunity for Improvement

1b.1 Benefits (improvements in quality) envisioned by use of this measure: Quality improvement efforts can be enhanced and stimulated by a clear understanding of how an entity (e.g., an institution) is performing in comparison to other entities. Information regarding overall performance can be difficult to obtain because of the extreme diversity of conditions that comprise congenital heart disease. Even the most common lesions make up only a small fraction of most surgical case loads. Measurement tools that can include all or most of a total surgical caseload should provide a more precise and better reflection of overall performance.

1b.2 Summary of data demonstrating performance gap (variation or overall poor performance) across providers:
Adjusted per 1,000 rates by patient and hospital characteristics, 2007

Mean	Standard error	Location	P-value: Relative to Northeast
63.931	7.946	Northeast	1.000
30.730	2.637	Midwest	0.000
44.326	1.760	South	0.016
33.496	3.316	West	0.000

1b.3 Citations for data on performance gap:
See the following report for a complete treatment of the methodology: “Methods: Applying AHRQ Quality Indicators to Healthcare Cost and Utilization Project (HCUP) Data for the National Healthcare Quality Report” [URL: http://hcupnet.ahrq.gov/QI%20Methods.pdf?JS=Y]

1b.4 Summary of Data on disparities by population group:
1) Estimate 2) Standard error 3) P-value: Relative to marked group-c 4) P-value: 2007 relative to 2006

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Median income of patient´s ZIP code:
First quartile (lowest income) 44.830 2.315 0.394 0.112
Second quartile 39.643 2.577 0.671 0.053
Third quartile 32.492 2.639 0.034 0.679
Fourth quartile (highest income)c 41.414 3.276 0.043

Expected payment source:
Private insurancec 29.862 2.198 0.297
Medicare * * * DNC
Medicaid 45.617 1.707 0.000 0.129
Other insurance 52.447 8.437 0.010 0.494
Uninsured / self-pay / no charge 44.691 10.293 0.159 0.182

1b.5 Citations for data on Disparities:
AHRQ 2007 Nationwide Inpatient Sample (NIS)

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 outcome (mortality) that is relevant to a neonatal population with a diagnosis of congenital heart defect or procedure for congenital heart repair. Congenital heart defects engender major risks for death and lifelong disability. Despite recent advances, these conditions remain the most frequent type of birth defect, resulting in the highest mortality risk from birth defects in infancy, and are the leading medical cause of death in children until adolescence. Despite advances leading to increased survival, analyses continue to demonstrate wide variation in mortality outcomes among institutions and practitioners. Variation in in-hospital mortality following repair of a congenital heart defect has been demonstrated across racial/ethnic groups and by type of insurance. NQF has endorsed less than 20 clinician-level
performance measures in the areas of cardiac surgery and fewer in the pediatric surgical population. The modified RACHS-1 method adjusts for baseline risk differences and allows meaningful comparisions of in-patient mortality groups of children undergoing surgery for congenital heart disease.

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: Quality-of-care evaluation must take into account variations in "case mix." One 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) risk categories. (Note that the full RACHS-1 risk adjustment model was not applied, only the risk category component.) With both RACHS-1

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N ☐

risk category and ABC, as complexity increases, discharge mortality also increases. The ABC approach allows classification of more operations (by design; RACHS-1 includes only repair of a congenital heart defect, not all cardiac procedures), 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*): [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:
Not Applicable.

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***):** Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator with a code of pediatric heart surgery with ICD-9-CM diagnosis of congenital heart disease 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***):** Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator with a code of pediatric heart surgery with ICD-9-CM diagnosis of congenital heart disease in any field.	
2a.4 Denominator Statement (*Brief, text description of the denominator - target population being measured***):** Discharges under age 18 with ICD-9-CM procedure codes for congenital heart disease (1P) in any field or non-specific heart surgery (2P) in any field with ICD-9-CM diagnosis of congenital heart disease (2D) in any field. **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***):** Time window can be determined by user, but is generally a calendar year. **2a.8 Denominator Details (***All information required to collect/calculate the denominator - the target population being measured - including all codes, logic, and definitions***):** Discharges under age 18 with ICD-9-CM procedure codes for 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	**2a-specs** C☐ P☐ M☐ N☐

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
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

2a.9 Denominator Exclusions (*Brief text description of exclusions from the target population***):** 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)
• with diagnosis of ASD or VSD (5D) with PDA as the only cardiac procedure
• heart transplant (7P)
• premature infants (4D) with PDA closure (3D and 3EP) as only cardiac procedure;

• age less than or equal to 30 days with PDA closure as only cardiac procedure
• missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1 =missing)
• transferring to another short-term hospital (DISP=2)
• neonates with birth weight less than 500 grams (Birth Weight Category 1)

2a.10 Denominator Exclusion Details (*All information required to collect exclusions to the denominator, including all codes, logic, and definitions***):**
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)
• with diagnosis of ASD or VSD (5D) with PDA as the only cardiac procedure
• heart transplant (7P)
• premature infants (4D) with PDA closure (3D and 3EP) as only cardiac procedure;
• age less than or equal to 30 days with PDA closure as only cardiac procedure
• missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1 =missing)
• transferring to another short-term hospital (DISP=2)
• neonates with birth weight less than 500 grams (Birth Weight Category 1)

A neonate is defined as any discharge with age in days at admission between zero and 28 days (inclusive). If age in days is missing, then a neonate is defined as an admission type of newborn (SID ATYPE=4) OR an ICD-9-CM code for either in-hospital live birth or neonate observation and evaluation.

Newborn in Hospital Live Birth Codes
V3000
SINGLE LB IN-HOSP W/O CS OCT05-
V3001
SINGLE LB IN-HOSP W CS OCT05-
V3100
TWIN-MATE LB-HOSP W/O CS OCT05-
V3101
TWIN-MATE LB-IN HOS W CS OCT05-
V3200
TWIN-MATE SB-HOSP W/O CS OCT05-
V3201
TWIN-MATE SB-HOSP W CS OCT05-
V3300
TWIN-NOS-IN HOSP W/O CS OCT05-
V3301
TWIN-NOS-IN HOSP W CS OCT05-
V3400
OTH MULT LB-HOSP W/O CS OCT05-
V3401
OTH MULT LB-IN HOSP W CS OCT05-
V3500
OTH MULT SB-HOSP W/O CS OCT05-
V3501
OTH MULT SB-IN HOSP W CS OCT05-
V3600
MULT LB/SB-IN HOS W/O CS OCT05-
V3601
MULT LB/SB-IN HOSP W CS OCT05-
V3700
MULT BRTH NOS-HOS W/O CS OCT05-
V3701

MULT BIRTH NOS-HOSP W CS OCT05-
V3900
LIVEBORN NOS-HOSP W/O CS OCT05-
V3901
LIVEBORN NOS-HOSP W CS OCT05-

Neonate Observation and Evaluation codes:
V290
NB OBSRV SUSPCT INFECT
V291
NB OBSRV SUSPCT NEURLGCL
V292
OBSRV NB SUSPC RESP COND
V293
NB OBS GENETC/METABL CND
V298
NB OBSRV OTH SUSPCT COND
V299
NB OBSRV UNSP SUSPCT CND

Less than 500 grams - Birth Weight Category 1
76401
LIGHT-FOR-DATES <500G
76411
LT-FOR-DATE W/MAL <500G
76421
FETAL MALNUTRITION <500G
76491
FET GROWTH RETARD <500G
76501
EXTREME IMMATUR <500G
76511
PRETERM NEC <500G
V2131
LOW BIRTHWT STATUS <500G

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

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

Extracorporeal circulation (5P):
3961
EXTRACORPOREAL CIRCULAT

Atrial Septal Defect or Ventricular Septal Defect diagnosis (5D):
7454
VENTRICULAR SEPT DEFECT
7455
SECUNDUM ATRIAL SEPT DEF

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

Heart Transplant (7P):
375
HEART TRANSPLANTATION (invalid as of OCT03)
3751
HEART TRANSPLANTATION OCT03-
3752
IMPLANT TOT REP HRT SYS OCT03-

Premature infants (4D):
76500
EXTREME IMMATUR WTNOS
76501
EXTREME IMMATUR <500G
76502
EXTREME IMMATUR 500-749G
76503
EXTREME IMMATUR 750-999G
76504
EXTREME IMMAT 1000-1249G
76505
EXTREME IMMAT 1250-1499G
76506
EXTREME IMMAT 1500-1749G
76507
EXTREME IMMAT 1750-1999G
76508
EXTREME IMMAT 2000-2499G
76509
EXTREME IMMAT 2500+G
76510
PRETERM INFANT NEC WTNOS
76511
PRETERM NEC <500G
76512
PRETERM NEC 500-749G
76513
PRETERM NEC 750-999G
76514
PRETERM NEC 1000-1249G
76515
PRETERM NEC 1250-1499G
76516
PRETERM NEC 1500-1749G
76517
PRETERM NEC 1750-1999G
76518

PRETERM NEC 2000-2499G
76519
PRETERM NEC 2500+G

2a.11 Stratification Details/Variables (*All information required to stratify the measure including the stratification variables, all codes, logic, and definitions***):**
The user has the option to stratify by gender, birth weight, age in days, age in years, race / ethnicity, primary payer, and custom stratifiers.

2a.12-13 Risk Adjustment Type: Risk adjustment method widely or commercially available

2a.14 Risk Adjustment Methodology/Variables (*List risk adjustment variables and describe conceptual models, statistical models, or other aspects of model or method***):**
PDI: The predicted value for each case is computed using a logistic regression with Generalized Estimating Equations (GEE) to account for within hospital correlation containing RACHS-1 risk category; age category (<= 28 days, 29 to 90 days, 91 days to 1 year, 1 to 17 years); birth weight <2500 grams; non-cardiac structural anomaly (modified CCS 217); admission transferred in; and combination of congenital heart surgery procedures performed during admission. The reference population used in the model is the universe of discharges for states that participate in the HCUP State Inpatient Databases (SID) for the year 2008 (updated annually), a database consisting of 43 states and approximately 7 million pediatric discharges. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate (standardized mortality ratio), multiplied by the reference population rate.
The model includes additional covariates for RACHS-1 risk categories, and multiple congenital heart procedures during the admission.
Required data elements: Age in days up to 364, then age years at admission; International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) principal and secondary diagnosis codes; admission type; admission source.

2a.15-17 Detailed risk model available Web page URL or attachment: Attachment Pediatric Heart Surgery (RACHS-1).docx

2a.18-19 Type of Score: Rate/proportion
2a.20 Interpretation of Score: Better quality = Lower score
2a.21 Calculation Algorithm (*Describe the calculation of the measure as a flowchart or series of steps***):**
The indicator is expressed as a rate, and is defined as outcome of interest / population at risk or numerator / denominator. A standardized mortality ratio will also be reported. The AHRQ Quality Indicators (AHRQ QI) software performs five steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix, based on the standardized mortality ratio. 6) Calculate smoothed rate. A univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator. Full information on calculation algorithms and specifications can be found at http://qualityindicators.ahrq.gov/modules/pdi_resources.aspx.

2a.22 Describe the method for discriminating performance *(e.g., significance testing)***:**
Significance testing is not prescribed by the software. Users may calculate a confidence interval for the risk-adjusted rates or standardized mortality ratios, and a posterior probability interval for the smoothed rates at a 95% or 99% level. Users may define the relevant benchmark and the methods of discriminating performance according to their application.

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://qualityindicators.ahrq.gov/Software/Default.aspx

2a.29-31 **Data dictionary/code table web page URL or attachment:** URL None
http://qualityindicators.ahrq.gov/Downloads/Software/WinQI/V42/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)*: 2008 State Inpatient Databases (SID), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality (AHRQ); 6 million pediatric discharges and 3,500 hospitals

2b.2 **Analytic Method** *(type of reliability & rationale, method for testing)*:
The signal to noise ratio is the ratio of the between hospital variance (signal) to the within hospital variance (noise). The formula is signal / (signal + noise). The ratio itself is only a diagnostic for the degree of variance in the risk-adjusted rate systematically associated with the provider. Therefore, what matters is the magnitude of the variance in the "smoothed" rate (that is, the variance in the risk-adjusted rate after the application of the univariate shrinkage estimator based on the signal ratio).

2b.3 **Testing Results** *(reliability statistics, assessment of adequacy in the context of norms for the test conducted)*:
What the data demonstrate is systematic variation in the provider level rate of 1.8 to 6.1 per 100 from the 5th to 95th percentile after a signal ratio of 0.608 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

2b C☐ P☐ M☐ N☐

2c. Validity testing

2c.1 **Data/sample** *(description of data/sample and size)*: Original derivation of RACHS-1:
(1) Pediatric Cardiac Care Consortium (PCCC) database 1996; 4370 cases from 32 institutions.
(2) Hospital discharge data from three states (Illinois 1994, Massachusetts 1995, California 1195); 3646 total cases.
Subsequent validation:
(3) 1996 hospital discharge data from six states (California, Illinois, Massachusetts, New York, Pennsylvania, Washington); 4318 total cases.
(4) Retrospectively collected primary data from a newly created pediatric cardiac care program in Guatemala, 1997-2004.
(5) Kids´ Inpatient Database 2000.
Current Data:
(6) State Inpatient Data (SID) 2008

2c C☐ P☐ M☐ N☐

2c.2 Analytic Method *(type of validity & rationale, method for testing)*:
Discrimination of the risk adjustment method has been quantified using the area under the receiver-operator characteristic (ROC) curve (also called the c statistic); calibration was assessed using the Hosmer-Lemeshow test or risk decile plot.

2c.3 Testing Results *(statistical results, assessment of adequacy in the context of norms for the test conducted)*:
(1) Area under the ROC curve for the full RACHS-1 model 0.811; p value for Hosmer-Lemeshow test 0.34.
(2) Area under the ROC curve 0.814; p value for Hosmer-Lemeshow test 0.21.
(3) Area under the ROC curve 0.818; p value for Hosmer-Lemeshow test 0.83.
(4) Area under the ROC curve 0.854.
(5) Area under the ROC curve 0.828; p value for Hosmer-Lemeshow test 0.66.
(6) Area under the ROC curve 0.828. Risk decile plot:

Decile	Obs	Exp	N
1	6	10.03	1,753
2	16	11.26	1,752
3	11	12.81	1,753
4	30	19.42	1,752
5	22	24.05	1,753
6	21	30.26	1,752
7	42	49.36	1,753
8	72	72.52	1,752
9	140	138.73	1,753
10	294	285.56	1,752

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:
Measures of Pediatric Health Care Quality Based on Hospital Administrative Data, The Pediatric Quality Indicators. Ver 3.1 March 2007
http://qualityindicators.ahrq.gov/Downloads/Software/SAS/V31/pdi_measures_v31.pdf

2d.3 Data/sample *(description of data/sample and size)*: AHRQ 2007 State Inpatient Databases (SID) with 3,500 hospitals and 6 million pediatric discharges

2d.4 Analytic Method *(type analysis & rationale)*:
Expert panel

2d.5 Testing Results *(e.g., frequency, variability, sensitivity analyses)*:
Measures of Pediatric Health Care Quality Based on Hospital Administrative Data, The Pediatric Quality Indicators. Ver 3.1 March 2007
http://qualityindicators.ahrq.gov/Downloads/Software/SAS/V31/pdi_measures_v31.pdf

2d
C ☐
P ☐
M ☐
N ☐
NA ☐

2e. Risk Adjustment for Outcomes/ Resource Use Measures

2e.1 Data/sample *(description of data/sample and size)*: AHRQ 2007 State Inpatient Databases (SID) with 3,500 hospitals and 6 million pediatric discharges

2e.2 Analytic Method *(type of risk adjustment, analysis, & rationale)*:
Risk-adjustment models use a standard set of categories based on readily available classification systems for demographics, severity of illness and comorbidities. Covariates were selected based on statistical significance, discrimination, face validity, and prior validation of the RACHS-1 methodology. Covariates included will be the same for future versions of the SID database.

2e
C ☐
P ☐
M ☐
N ☐
NA ☐

2e.3 Testing Results *(risk model performance metrics)*: C-statistic 0.815 **2e.4 If outcome or resource use measure is not risk adjusted, provide rationale:** Not applicable	
2f. Identification of Meaningful Differences in Performance **2f.1 Data/sample from Testing or Current Use** *(description of data/sample and size)*: AHRQ 2008 State Inpatient Databases (SID) with 3,500 hospitals and 6 million pediatric discharges **2f.2 Methods to identify statistically significant and practically/meaningfully differences in performance** *(type of analysis & rationale)*: Posterior probability distribution parameterized using the Gamma distribution **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)*: 5th 25th Median 75th 95th 0.018580.027790.035770.045160.06129	**2f** C☐ P☐ 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)*: Median income of patient´s ZIP code: 1) Estimate 2) Standard error 3) P-value: Relative to marked group-c 4) P-value: 2007 relative to 2006 First quartile (lowest income) 44.830 2.315 0.394 0.112 Second quartile 39.643 2.577 0.671 0.053 Third quartile 32.492 2.639 0.034 0.679 Fourth quartile (highest income)c 41.414 3.276 0.043 **2h.2 If disparities have been reported/identified, but measure is not specified to detect disparities, provide follow-up plans:** Users may stratify based on gender and race/ethnicity	**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)
Florida Health Finder
http://www.floridahealthfinder.gov/

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 be used 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 used in the MONAHRQ system that is provide 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*

3a
C☐
P☐
M☐
N☐

for public reporting and quality improvement) 3a.4 **Data/sample** *(description of data/sample and size)*: AHRQ 2007 State Inpatient Databases (SID) with 3,500 hospitals and 6 million pediatric 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?** Measures are harmonized	**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:** Paired volume and mortality 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	**Eval**

implemented for performance measurement. (evaluation criteria)	Rating
4a. Data Generated as a Byproduct of Care Processes **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)	**4a** C☐ 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://qualityindicators.ahrq.gov/software/default.aspx **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://qualityindicators.ahrq.gov/software/default.aspx **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://qualityindicators.ahrq.gov/software/default.aspx	**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-limited** ☐
Steering Committee: Do you recommend for endorsement? **Comments:**	**Y** ☐ **N** ☐ **A** ☐

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)
Co.1 Organization
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Co.2 Point of Contact
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Measure Developer If different from Measure Steward
Co.3 Organization
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Co.4 Point of Contact
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Co.5 Submitter If different from Measure Steward POC
John, Bott, MSSW, MBA, John.Bott@AHRQ.hhs.gov, 301-427-1317-, Agency for Healthcare Research and Quality

Co.6 Additional organizations that sponsored/participated in measure development
UC Davis,
Stanford University,
Battelle Memorial Institute,
Children´s Hospital of Boston

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: 2006
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? 08, 2011

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

Ad.11 Disclaimers:

Ad.12 -14 Additional Information web page URL or attachment:

Date of Submission (*MM/DD/YY*)**:** 02/01/2011

Pediatric Heart Surgery (RACHS-1)

Risk Adjustment

Parameter	DF	Estimate	Standard Error	Chi-Square	Pr>Chi-Square	Odds Ratio	Lower Bound	Upper Bound	Pr<.05
Intercept	1	-5.1385	0.2542	408.73	0.0000				
Risk Category 1 (omit)									
Risk Category 2	1	0.0840	0.2618	0.10	0.7484	1.088	0.651	1.817	
Risk Category 3	1	0.8220	0.2800	8.62	0.0033	2.275	1.314	3.938	*
Risk Category 4	1	1.0240	0.2920	12.30	0.0005	2.784	1.571	4.935	*
Risk Category 5 and 6	1	1.6405	0.2922	31.52	0.0000	5.158	2.909	9.145	*
Age 1 to 17 (years) (omit)									
Age 91 to 364 (days)	1	0.1745	0.1461	1.42	0.2326	1.191	0.894	1.586	
Age 29 to 90 (days)	1	1.0864	0.1619	45.06	0.0000	2.964	2.158	4.070	*
Age 0 to 28 (days)	1	1.8375	0.1658	122.86	0.0000	6.281	4.538	8.692	*
Birth weight (500 to 2499g)	1	0.6752	0.1415	22.76	0.0000	1.964	1.489	2.592	*
Other congenital anomalies*	1	0.2365	0.0896	6.97	0.0083	1.267	1.063	1.510	*
Multiple procedures	1	0.7857	0.0988	63.28	0.0000	2.194	1.808	2.662	*
Transfer-in	1	-0.0407	0.1194	0.12	0.7332	0.960	0.760	1.213	

Source: 2008 State Inpatient Databases (SID); Healthcare Cost and Utilization Project (HCUP); Agency for Healthcare Research and Quality (AHRQ); *CCS 217 less 758.xx; c-statistic 0.815; N=17,525

Provider Distribution

	Reference Population	Signal Variance	Signal Std. Dev.	Signal Ratio	5th	25th	Median	75th	95th
Rate	0.03731	0.00017362	0.01317	0.608	0.01858	0.02779	0.03577	0.04516	0.06129
Ratio	1.000	0.124705	0.353	0.608	0.498	0.744	0.958	1.210	1.642

Source: 2008 State Inpatient Databases (SID); Healthcare Cost and Utilization Project (HCUP); Agency for Healthcare Research and Quality (AHRQ)

Risk Decile Plot

Decile	Observed	Expected	N
1	6	10.03	1,753
2	16	11.26	1,752
3	11	12.81	1,753
4	30	19.42	1,752
5	22	24.05	1,753
6	21	30.26	1,752
7	42	49.36	1,753
8	72	72.52	1,752
9	140	138.73	1,753
10	294	285.56	1,752
	654	654	17,525