NATIONAL QUALITY FORUM

Measure Information

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

Brief Measure Information

NQF #: 0714
Corresponding Measures:
De.2. **Measure Title:** Standardized mortality ratio for neonates undergoing non-cardiac surgery
Co.1.1. **Measure Steward:** Boston Children's Hospital, Center for Patient Safety and Quality Research
De.3. **Brief Description of Measure:** This measure is a ratio of observed to expected rate of in-hospital mortality following non-cardiac surgery among infants <= 30 days of age, risk-adjusted.
1b.1. **Developer Rationale:** Non-cardiac neonatal surgery is performed in a variety of settings and for a broad spectrum of diseases. The number of operations for a specific disease entity is relatively low making meaningful comparisons between various populations or health-care systems difficult. A risk-adjustment method for newborns undergoing non-cardiac surgery allows an assessment of a wide variety of surgical procedures and thereby permits comparisons of in-hospital mortality of large groups by adjusting for case mix complexity. Understanding the variation is critical to guide quality improvement.

S.4. **Numerator Statement:** Cases of non-cardiac surgery among infants <= 30 days of age resulting in in-hospital death.
S.7. **Denominator Statement:** Total cases of non-cardiac surgery among infants <= 30 days of age.
S.10. **Denominator Exclusions:** Patients > 30 days of age at time of surgery; those undergoing cardiac surgery or having a major structural cardiac defect (excluding atrial and ventricular septal defects and patent ductus arteriosus); neonates undergoing procedures which were endoscopic or closed; catheterizations; circumcisions; and sutures of superficial lacerations.

De.1. **Measure Type:** Outcome
S.23. **Data Source:** Claims, Electronic Health Records, Paper Medical Records
S.26. **Level of Analysis:** Facility

IF Endorsement Maintenance – Original Endorsement Date: Jan 17, 2011 **Most Recent Endorsement Date:** Sep 20, 2012

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

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

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

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

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

1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form
Evidence_New.docx

1b. Performance Gap

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

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

- disparities in care across population groups.

1b.1. **Briefly explain the rationale for this measure** *(e.g., the benefits or improvements in quality envisioned by use of this measure)*
Non-cardiac neonatal surgery is performed in a variety of settings and for a broad spectrum of diseases. The number of operations for a specific disease entity is relatively low making meaningful comparisons between various populations or health-care systems difficult. A risk-adjustment method for newborns undergoing non-cardiac surgery allows an assessment of a wide variety of surgical procedures and thereby permits comparisons of in-hospital mortality of large groups by adjusting for case mix complexity. Understanding the variation is critical to guide quality improvement.

1b.2. **Provide performance scores on the measure as specified (current and over time) at the specified level of analysis.** *(This is required for endorsement maintenance. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included). This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.*
Mortality associated with neonatal and infant surgery varies across institutions, surgeons, and other patient groups.

1b.3. **If no or limited performance data on the measure as specified is reported in 1b2, then provide a summary of data from the literature that indicates opportunity for improvement or overall less than optimal performance on the specific focus of measurement.**
Grushka JR, Laberge JM, Puligandla P, Skarsgard ED, Canadian Pediatric Surgery N. Effect of hospital case volume on outcome in congenital diaphragmatic hernia: the experience of the Canadian Pediatric Surgery Network. J Pediatr Surg. 2009;44(5):873-6.
Arnold MA, Chang DC, Nabaweesi R, Colombani PM, Bathurst MA, Mon KS, Hosmane S, Abdullah F. Risk stratification of 4344 patients with gastroschisis into simple and complex categories. J Pediatr Surg. 2007;42(9):1520-5.
Javid PJ, Jaksic T, Skarsgard ED, Lee S, Canadian Neonatal N. Survival rate in congenital diaphragmatic hernia: the experience of the Canadian Neonatal Network. J Pediatr Surg. 2004;39(5):657-60.
Blakely ML, Tyson JE, Lally KP, McDonald S, Stoll BJ, Stevenson DK, Poole WK, Jobe AH, Wright LL, et al. Laparotomy versus peritoneal drainage for necrotizing enterocolitis or isolated intestinal perforation in extremely low birth weight infants: outcomes through 18 months adjusted age. Pediatrics. 2006;117(4):e680-7.

1b.4. **Provide disparities data from the measure as specified (current and over time) by population group, e.g., by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability.** *(This is required for endorsement maintenance. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include.) This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.*
N/A

1b.5. **If no or limited data on disparities from the measure as specified is reported in 1b4, then provide a summary of data from the literature that addresses disparities in care on the specific focus of measurement. Include citations.**
N/A

1c. High Priority (previously referred to as High Impact)

The measure addresses:

- a specific national health goal/priority identified by DHHS or the National Priorities Partnership convened by NQF; OR
- a demonstrated high-priority (high-impact) aspect of healthcare (e.g., affects large numbers of patients and/or has a substantial impact for a smaller population; leading cause of morbidity/mortality; high resource use (current and/or future); severity of illness; and severity of patient/societal consequences of poor quality).

1c.1. **Demonstrated high priority aspect of healthcare**
Leading cause of morbidity/mortality
1c.2. **If Other:**

1c.3. **Provide epidemiologic or resource use data that demonstrates the measure addresses a high priority aspect of healthcare. List citations in 1c.4.**
Compared to an adult population, surgery in neonates is rare. However, with advances in neonatal care it is increasingly used to address a wide variety of congenital and acquired conditions. Such interventions have significant risks of morbidity and mortality.

To date, investigations typically involve a specific disease entity such as congenital diaphragmatic hernia, necrotizing enterocolitis, gastroschisis or infant lung pathology requiring resection.

1c.4. **Citations for data demonstrating high priority provided in 1a.3**

Mettauer NL, Pierce CM, Cassidy JV, Kiely EM, Petros AJ. One-year survival in congenital diaphragmatic hernia, 1995-2006. Arch Dis Child. 2009;94(5):407.
Sangkhathat S, Patrapinyokul S, Tadtayathikom K, Osatakul S. Peri-operative factors predicting the outcome of hepatic porto-enterostomy in infants with biliary atresia. J Med Assoc Thai. 2003;86(3):224-31.
Arnold MA, Chang DC, Nabaweesi R, Colombani PM, Bathurst MA, Mon KS, Hosmane S, Abdullah F. Risk stratification of 4344 patients with gastroschisis into simple and complex categories. J Pediatr Surg. 2007;42(9):1520-5.
Aspirot A, Puligandla PS, Bouchard S, Su W, Flageole H, Laberge JM. A contemporary evaluation of surgical outcome in neonates and infants undergoing lung resection. J Pediatr Surg. 2008;43(3):508-12.
Fisher JC, Jefferson RA, Arkovitz MS, Stolar CJ. Redefining outcomes in right congenital diaphragmatic hernia. J Pediatr Surg. 2008;43(2):373-9.
Grushka JR, Laberge JM, Puligandla P, Skarsgard ED, Canadian Pediatric Surgery N. Effect of hospital case volume on outcome in congenital diaphragmatic hernia: the experience of the Canadian Pediatric Surgery Network. J Pediatr Surg. 2009;44(5):873-6.
Ameh EA. Morbidity and mortality of inguinal hernia in the newborn. Niger Postgrad Med J. 2002;9(4):233-4.
Kurscheid T, Holschneider AM. Necrotizing enterocolitis (NEC)--mortality and long-term results. Eur J Pediatr Surg. 1993;3(3):139-43.

1c.5. **If a PRO-PM (e.g. HRQoL/functional status, symptom/burden, experience with care, health-related behaviors), provide evidence that the target population values the measured PRO and finds it meaningful.** *(Describe how and from whom their input was obtained.)*
N/A

2. Reliability and Validity—Scientific Acceptability of Measure Properties

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

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

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

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

S.1. **Measure-specific Web Page** *(Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.)*
N/A

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

S.2b. **Data Dictionary, Code Table, or Value Sets** *(and risk model codes and coefficients when applicable) must be attached. (Excel or csv file in the suggested format preferred - if not, contact staff)*
Attachment **Attachment:** Item 2a.29 Data Dictionary-634650840150430090-634695658248172729-635289372490907247.doc

S.3. **For endorsement maintenance**, please briefly describe any changes to the measure specifications since last endorsement date

and explain the reasons.

S.4. **Numerator Statement** *(Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome)*
IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.
Cases of non-cardiac surgery among infants <= 30 days of age resulting in in-hospital death.

S.5. **Time Period for Data** *(What is the time period in which data will be aggregated for the measure, e.g., 12 mo, 3 years, look back to August for flu vaccination? Note if there are different time periods for the numerator and denominator.)*
Not pre-specified, but a minimum of one year is recommended.

S.6. **Numerator Details** *(All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*
IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.
Number of cases of non-cardiac surgery among infants <= 30 days of age undergoing one of 66 eligible procedures where patient disposition is death prior to hospital discharge.

Eligible Surgical Procedures:

ICD-9-CM procedure codes are listed with each surgical procedure.

02.12	Other repair of cerebral meninges
02.2	Ventriculostomy
02.34	Ventricular shunt to abdominal cavity and organs
02.42	Replacement of ventricular shunt
03.51	Repair of spinal meningocele
03.52	Repair of spinal myelomeninigocele
18.29	Excision or destruction of other lesion of external ear (not preauricular sinus)
25.91	Lingual frenotomy
25.92	Lingual frenectomy
27.54	Repair of cleft lip
31.73	Closure of other fistula of trachea (tracheoesophageal fistulectomy)
33.1	Incision of lung
33.93	Puncture of lung
34.09	Other incision of pleura
43.11	Percutaneous endoscopic gastrostomy
43.19	Other gastrostomy
43.3	Pyloromyotomy
44.29	Other pyloroplasty (revision of pylorus)
44.66	Other procedures for creation of esophagogastric sphincteric competence
45.02	Other incision of small intestine (not duodenum)
45.26	Open biopsy of large intestine
45.62	Other partial resection of small intestine (duodenectomy, ileectomy, jejunectomy)
45.73	Right hemicolectomy (ileocolectomy, right radical colectomy)
45.76	Sigmoidectomy
45.79	Other partial excision of large intestine (enterocolectomy NEC)
45.91	Small-to-small intestinal anastomosis
46.01	Exteriorization of small intestine (loop ileostomy)
46.03	Exteriorization of large intestine
46.10	Colostomy, not otherwise specified
46.11	Temporary colostomy

46.13 Other permanent colostomy
46.20 Ileostomy, not otherwise specified
46.21 Temporary ileostomy
46.39 Other enterostomy (duodenostomy, feeding enterostomy)
46.51 Closure of stoma of small intestine
46.79 Other repair of intestine (duodenoplasty)
46.81 Intra-abdominal manipulation of small intestine
47.09 Other appendectomy (not laparoscopic)
48.25 Open biopsy of rectum
48.41 Soave submucosal resection of rectum
48.49 Other pull-through resection of rectum
49.79 Other repair of anal sphincter (repair of old obstetric laceration of anus)
53.02 Repair of indirect inguinal hernia
53.10 Bilateral repair of inguinal hernia, not otherwise specified
53.12 Bilateral repair of indirect inguinal hernia
53.49 Other umbilical herniorrhaphy (not with prosthesis)
53.7 Repair of diaphragmatic hernia, abdominal approach
53.71 Laparascopic repair of diaphragmatic hernia, abdominal approach
53.72 Other and open repair of diaphragmatic hernia, abdominal approach
53.75 Repair of diaphragmatic hernia, abdomimal approach, not otherwise specified
53.80 Repair of diaphragmatic hernia with thoracic approach, not otherwise specified
54.11 Exploratory laparotomy
54.12 Reopening of recent laparotomy site
54.21 Laparoscopy (peritoneoscopy)
54.3 Excision or destruction of lesion or tissue of abdominal wall or umbilicus (debridement of abdominal wall, omphalectomy)
54.59 Other lysis of peritoneal adhesions (not laparoscopic)
54.71 Repair of gastroschisis
54.72 Other repair of abdominal wall
54.95 Incision of peritoneum
62.3 Unilateral orchiectomy
62.5 Orchiopexy
64.49 Other repair of penis
64.91 Dorsal or lateral slit of prepuce
64.92 Incision of penis
64.93 Division of penile adhesions
84.03 Amputation through hand

S.7. **Denominator Statement** *(Brief, narrative description of the target population being measured)*
Total cases of non-cardiac surgery among infants <= 30 days of age.

S.8. **Target Population Category** *(Check all the populations for which the measure is specified and tested if any):*
Children

S.9. **Denominator Details** *(All information required to identify and calculate the target population/denominator such as definitions, specific data collection items/responses , code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*
Number of cases of non-cardiac surgery among infants <= 30 days of age undergoing one of 66 eligible procedures. See below for eligible procedures.

Eligible Surgical Procedures:

ICD-9-CM procedure codes are listed with each surgical procedure.

02.12 Other repair of cerebral meninges

02.2	Ventriculostomy
02.34	Ventricular shunt to abdominal cavity and organs
02.42	Replacement of ventricular shunt
03.51	Repair of spinal meningocele
03.52	Repair of spinal myelomeninigocele
18.29	Excision or destruction of other lesion of external ear (not preauricular sinus)
25.91	Lingual frenotomy
25.92	Lingual frenectomy
27.54	Repair of cleft lip
31.73	Closure of other fistula of trachea (tracheoesophageal fistulectomy)
33.1	Incision of lung
33.93	Puncture of lung
34.09	Other incision of pleura
43.11	Percutaneous endoscopic gastrostomy
43.19	Other gastrostomy
43.3	Pyloromyotomy
44.29	Other pyloroplasty (revision of pylorus)
44.66	Other procedures for creation of esophagogastric sphincteric competence
45.02	Other incision of small intestine (not duodenum)
45.26	Open biopsy of large intestine
45.62	Other partial resection of small intestine (duodenectomy, ileectomy, jejunectomy)
45.73	Right hemicolectomy (ileocolectomy, right radical colectomy)
45.76	Sigmoidectomy
45.79	Other partial excision of large intestine (enterocolectomy NEC)
45.91	Small-to-small intestinal anastomosis
46.01	Exteriorization of small intestine (loop ileostomy)
46.03	Exteriorization of large intestine
46.10	Colostomy, not otherwise specified
46.11	Temporary colostomy
46.13	Other permanent colostomy
46.20	Ileostomy, not otherwise specified
46.21	Temporary ileostomy
46.39	Other enterostomy (duodenostomy, feeding enterostomy)
46.51	Closure of stoma of small intestine
46.79	Other repair of intestine (duodenoplasty)
46.81	Intra-abdominal manipulation of small intestine
47.09	Other appendectomy (not laparoscopic)
48.25	Open biopsy of rectum
48.41	Soave submucosal resection of rectum
48.49	Other pull-through resection of rectum
49.79	Other repair of anal sphincter (repair of old obstetric laceration of anus)
53.02	Repair of indirect inguinal hernia
53.10	Bilateral repair of inguinal hernia, not otherwise specified
53.12	Bilateral repair of indirect inguinal hernia
53.49	Other umbilical herniorrhaphy (not with prosthesis)
53.7	Repair of diaphragmatic hernia, abdominal approach
53.71	Laparascopic repair of diaphragmatic hernia, abdominal approach
53.72	Other and open repair of diaphragmatic hernia, abdominal approach
53.75	Repair of diaphragmatic hernia, abdomimal approach, not otherwise specified
53.80	Repair of diaphragmatic hernia with thoracic approach, not otherwise specified
54.11	Exploratory laparotomy
54.12	Reopening of recent laparotomy site
54.21	Laparoscopy (peritoneoscopy)
54.3	Excision or destruction of lesion or tissue of abdominal wall or umbilicus (debridement of abdominal wall, omphalectomy)
54.59	Other lysis of peritoneal adhesions (not laparoscopic)

54.71 Repair of gastroschisis
54.72 Other repair of abdominal wall
54.95 Incision of peritoneum
62.3 Unilateral orchiectomy
62.5 Orchiopexy
64.49 Other repair of penis
64.91 Dorsal or lateral slit of prepuce
64.92 Incision of penis
64.93 Division of penile adhesions
84.03 Amputation through hand

S.10. **Denominator Exclusions** *(Brief narrative description of exclusions from the target population)*
Patients > 30 days of age at time of surgery; those undergoing cardiac surgery or having a major structural cardiac defect (excluding atrial and ventricular septal defects and patent ductus arteriosus); neonates undergoing procedures which were endoscopic or closed; catheterizations; circumcisions; and sutures of superficial lacerations.

S.11. **Denominator Exclusion Details** *(All information required to identify and calculate exclusions from the denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*
Neonates undergoing cardiac surgery are excluded because a risk adjustment method for congenital heart surgery already exists. Other excluded procedures are: endoscopy (through natural anatomic openings, through previously made stomas, endoscopic procedures, endoscopic biopsies); closed (percutaneous) biopsies; closed reductions; sutures of superficial lacerations; catheterizations; dilations; injections; aspirations; radiologic procedures; dental extractions; laser/cryo/photocoagulation therapies; circumcisons; incidental procedures.

S.12. **Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b)*
N/A

S.13. **Risk Adjustment Type** (Select type. Provide specifications for risk stratification in S.12 and for statistical model in S.14-15)
Statistical risk model
If other:

S.14. **Identify the statistical risk model method and variables** *(Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development and testing should be addressed with measure testing under Scientific Acceptability)*
Variables are procedure risk category, any serious respiratory condition, necrotizing enterocolitis, prematurity, and neonatal sepsis. Details are provided below.

The risk adjustment method used incorporates 5 clinical characteristics:
i) four procedure risk categories,
ii) any serious respiratory condition,
iii) necrotizing enterocolitis,
iv) prematurity, and
v) neonatal sepsis

1) The four risk categories are based on the surgical procedure performed and are defined below. ICD-9-CM procedure codes are provided. Category 1 has the lowest risk of in-hospital death and category 4 the highest risk. Procedures not appearing on the list below are not eligible for this measure.

Risk Category 1

Nervous
Replacement of ventricular shunt (02.42)

Repair of spinal meningocele (03.51)
Repair of spinal myelomeninigocele (03.52)
ENMP
Excision or destruction of other lesion of external ear (not preauricular sinus) (18.29)
Lingual frenotomy (25.91)
Lingual frenectomy (25.92)
Repair of cleft lip (27.54)
Respiratory
Closure of other fistula of trachea (tracheoesophageal fistulectomy) (31.73)
Incision of lung (33.1)
Digestive
Pyloromyotomy (43.3)
Other pyloroplasty (revision of pylorus) (44.29)
Other procedures for creation of esophagogastric sphincteric competence (44.66)
Other incision of small intestine (not duodenum) (45.02)
Open biopsy of large intestine (45.26)
Sigmoidectomy (45.76)
Other partial excision of large intestine (enterocolectomy NEC) (45.79)
Small-to-small intestinal anastomosis (45.91)
Exteriorization of large intestine (46.03)
Colostomy (46.10, 46.11, 46.13)
Closure of stoma of small intestine (46.51)
Other repair of intestine (duodenoplasty) (46.79)
Intra-abdominal manipulation of small intestine (46.81)
Other appendectomy (not laparoscopic) (47.09)
Open biopsy of rectum (48.25)
Pull-through resection of rectum (48.41, 48.49)
Other repair of anal sphincter (repair of old obstetric laceration of anus) (49.79)
Repair of indirect inguinal hernia (53.02)
Bilateral repair of inguinal hernia, not otherwise specified (53.10)
Bilateral repair of indirect inguinal hernia (53.12)
Other umbilical herniorrhaphy (not with prosthesis) (53.49)
Laparoscopy (peritoneoscopy) (54.21)
Repair of gastroschisis/abdominal wall (54.71, 54.72)
Male Genital
Unilateral orchiectomy (62.3)
Orchiopexy (62.5)
Other repair of penis (64.49)
Dorsal or lateral slit of prepuce (64.91)
Incision of penis (64.92)
Division of penile adhesions (64.93)
Musculoskeletal
Amputation through hand (84.03)

Risk Category 2

Nervous
Ventricular shunt to abdominal cavity and organs (02.34)
Respiratory
Puncture of lung (33.93)
Digestive
Gastrostomy (43.11, 43.19)
Other partial resection of small intestine (duodenectomy, ileectomy, jejunectomy) (45.62)
Other enterostomy (duodenostomy, feeding enterostomy) (46.39)

Other lysis of peritoneal adhesions (not laparoscopic) (54.59)
Incision of peritoneum (54.95)

Risk Category 3

Nervous
Other repair of cerebral meninges (02.12)
Ventriculostomy (02.2)
Digestive
Exteriorization of small intestine (loop ileostomy)/Ileostomy (46.01, 46.20, 46.21)
Repair of diaphragmatic hernia (53.7, 53.71, 53.72, 53.75, 53.80)
Excision or destruction of lesion or tissue of abdominal wall or umbilicus (debridement of abdominal wall, omphalectomy) (54.3)

Risk Category 4

Digestive
Other incision of pleura (34.09)
Right hemicolectomy (ileocolectomy, right radical colectomy) (45.73)
Exploratory laparotomy (54.11)
Reopening of recent laparotomy site (54.12)

2) Patients are classified as having a serious respiratory condition if any of the following conditions are present. ICD-9-CM diagnosis codes are provided.

Respiratory distress syndrome (769)
Congenital pneumonia (770.0)
Meconium aspiration syndrome (770.1)
Interstitial emphysema (770.2)
Pulmonary hemorrhage (770.3)
Primary and obstructive apnea, cyanotic attack, and respiratory failure (770.8)

3) Necrotizing enterocolitis is defined by ICD-9-CM diagnosis code 777.5.

4) Prematurity is defined by the presence of ICD-9-CM diagnosis codes 765.0x, 765.1x, and/or 765.21-765.28.

5) Neonatal sepsis is defined by ICD-9-CM diagnosis code 771.8x.

The 5 clinical characteristics described above are incorporated as covariates in a multivariable logistic regression model with outcome in-hospital death. Risk categories 2, 3, and 4 are used as binary covariates, with category 1 as the reference group. Any serious respiratory condition, necrotizing enterocolitis, prematurity, and neonatal sepsis are binary covariates.

Reference:
Son JK, Lillehei CW, Gauvreau K, Jenkins KJ. A risk adjustment method for newborns undergoing noncardiac surgery. Annals of Surgery 2010; 251:754-758.

Son JK, Lillehei CW, Gauvreau K, Jenkins KJ. Risk Adjustment for Neontal Surgery (RANS): A method for comparison of in-hospital mortality. Pediarics (under review).

S.15. Detailed risk model specifications *(must be in attached data dictionary/code list Excel or csv file. Also indicate if available at measure-specific URL identified in S.1.)*
Note: Risk model details (including coefficients, equations, codes with descriptors, definitions), should be provided on a separate worksheet in the suggested format in the Excel or csv file with data dictionary/code lists at S.2b.

S.15a. **Detailed risk model specifications** (*if not provided in excel or csv file at S.2b*)

S.16. **Type of score:**
Ratio
If other:

S.17. **Interpretation of Score** *(Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)*
Better quality = Lower score

S.18. **Calculation Algorithm/Measure Logic** *(Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.)*
The measure is a standardized mortality ratio for infants <= 30 days of age undergoing non-cardiac surgery.

It is defined as the ratio of observed to expected rates of in-hospital mortality. This technique allows computation of an overall risk-adjusted measure of performance for groups of patients.

To begin, the observed mortality rate is calculated for each group. This is defined as the number of cases of non-cardiac surgery resulting in in-hospital death divided by the total number of cases of non-cardiac surgery.

Next, the expected mortality rate is calculated for each group. To do this, a multivariable logistic regression model with outcome in-hospital death is fitted. Five variables are incorporated as covariates: procedure risk categories 2, 3, and 4 as binary covariates, with category 1 as the reference group; presence of a serious respiratory condition; presence of necrotizing enterocolitis; prematuriy; and presence of neonatal sepsis. This logistic model is used to calculate the predicted probability of death for each individual case in the data set. The average predicted probability of death for all cases in a group, calculated by summing the predicted probabilities for each case and dividing by the total number of cases, represents the expected mortality rate for the group, adjusting for case mix.

The standardized mortality ratio (SMR) is then calculated as the observed mortality rate divided by the expected mortality rate.

If the observed mortality rate for a group is higher than expected, meaning that the group performs worse than would be expected given its case mix, the SMR is greater than 1. If the observed mortality rate for a group is lower than would be expected, indicating better than anticipated performance, the SMR is less than 1.

Reference:
Son JK, Lillehei CW, Gauvreau K, Jenkins KJ. A risk adjustment method for newborns undergoing noncardiac surgery. Annals of Surgery, 2010, Apr; 251 (4): 754-758.

Son JK, Lillehei CW, Gauvreau K, Jenkins KJ. Risk Adjustment for Neontal Surgery (RANS): A method for comparison of in-hospital mortality. Pediarics (under review).

S.19. **Calculation Algorithm/Measure Logic Diagram URL or Attachment** *(You also may provide a diagram of the Calculation Algorithm/Measure Logic described above at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)*

S.20. **Sampling** *(If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)*
IF a PRO-PM, identify whether (and how) proxy responses are allowed.
Not pre-specified, although it is recommended that the sample size be large enough such that there is at least one death in each procedure type risk group.

S.21. **Survey/Patient-reported data** *(If measure is based on a survey, provide instructions for conducting the survey and guidance on minimum response rate.)*
IF a PRO-PM, specify calculation of response rates to be reported with performance measure results.

S.22. **Missing data** (specify how missing data are handled, e.g., imputation, delete case.)
Required for Composites and PRO-PMs.

S.23. **Data Source** *(Check ONLY the sources for which the measure is SPECIFIED AND TESTED).*
If other, please describe in S.24.
Claims, Electronic Health Records, Paper Medical Records

S.24. **Data Source or Collection Instrument** *(Identify the specific data source/data collection instrument e.g. name of database, clinical registry, collection instrument, etc.)*
IF a PRO-PM, identify the specific PROM(s); and standard methods, modes, and languages of administration.
N/A

S.25. **Data Source or Collection Instrument** *(available at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)*

S.26. **Level of Analysis** *(Check ONLY the levels of analysis for which the measure is SPECIFIED AND TESTED)*
Facility

S.27. **Care Setting** *(Check ONLY the settings for which the measure is SPECIFIED AND TESTED)*
Inpatient/Hospital
If other:

S.28. **COMPOSITE Performance Measure** - Additional Specifications *(Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.)*

2a. Reliability – See attached Measure Testing Submission Form
2b. Validity – See attached Measure Testing Submission Form
0714_MeasureTesting_MSF5.0_Data-635278446659961565.doc

3. Feasibility

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

3a. Byproduct of Care Processes

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

3a.1. **Data Elements Generated as Byproduct of Care Processes.**
Generated or collected by and used by healthcare personnel during the provision of care (e.g., blood pressure, lab value, diagnosis, depression score), Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims), Abstracted from a record by someone other than person obtaining original information (e.g., chart abstraction for quality measure or registry), Other
If other: Electronic medical record

3b. Electronic Sources

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

3b.1. **To what extent are the specified data elements available electronically in defined fields?** *(i.e., data elements that are needed to compute the performance measure score are in defined, computer-readable fields)*

Yes

3b.2. **If ALL the data elements needed to compute the performance measure score are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.**

3b.3. **If this is an eMeasure, provide a summary of the feasibility assessment in an attached file or make available at a measure-specific URL.**
Attachment:

3c. Data Collection Strategy

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

3c.1. **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 and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.**
IF a PRO-PM, consider implications for both individuals providing PROM data (patients, service recipients, respondents) and those whose performance is being measured.
Not yet done.

3c.2. **Describe any fees, licensing, or other requirements to use any aspect of the measure as specified** *(e.g., value/code set, risk model, programming code, algorithm)*.

4. Usability and Use

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

4a. Accountability and Transparency

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

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

Planned	Current Use (for current use provide URL)
Public Reporting Quality Improvement (Internal to the specific organization)	

4a.1. **For each CURRENT use, checked above, provide:**

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

4a.2. **If not currently publicly reported OR used in at least one other accountability application (e.g., payment program,**

certification, licensing) what are the reasons? (*e.g., Do policies or actions of the developer/steward or accountable entities restrict access to performance results or impede implementation?*)

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

4b. Improvement

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

4b.1. **Progress on Improvement. (Not required for initial endorsement unless available.)**
Performance results on this measure (current and over time) should be provided in 1b.2 and 1b.4. Discuss:

- **Progress (trends in performance results, number and percentage of people receiving high-quality healthcare)**
- **Geographic area and number and percentage of accountable entities and patients included**

4b.2. **If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.**

4c. Unintended Consequences

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

4c.1. **Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.**
Because this measure can be applied in administrative databases, it can be subject to the coding inaccuracies sometimes associated with these databases. This problem is minimized if prospectively collected data are used.

5. Comparison to Related or Competing Measures

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

5. Relation to Other NQF-endorsed Measures

Are there related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population)? If yes, list the NQF # and title of all related and/or competing measures.
No

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

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

5a. Harmonization

The measure specifications are harmonized with related measures;
OR
The differences in specifications are justified

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

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

5b. Competing Measures

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

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

Appendix

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

Contact Information

Co.1 **Measure Steward (Intellectual Property Owner):** Boston Children's Hospital, Center for Patient Safety and Quality Research
Co.2 **Point of Contact:** Maria, Jorina, Maria.Jorina@childrens.harvard.edu, 617-919-3613-
Co.3 **Measure Developer if different from Measure Steward:** Boston Children´s Hospital, Center for Patient Safety and Quality Research
Co.4 **Point of Contact:** Maria, Jorina, Maria.Jorina@childrens.harvard.edu, 617-919-3613-

Additional Information

Ad.1 **Workgroup/Expert Panel involved in measure development**
Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.2 **Year the measure was first released:**
Ad.3 **Month and Year of most recent revision:**
Ad.4 **What is your frequency for review/update of this measure?**
Ad.5 **When is the next scheduled review/update for this measure?**

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

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