Neonatal Intensive Care All-Condition Readmissions Without Gestational Age

Section 1. Basic Measure Information

1.A. Measure Name

Neonatal Intensive Care All-Condition Readmissions Without Gestational Age

1.B. Measure Number

0208

1.C. Measure Description

Please provide a non-technical description of the measure that conveys what it measures to a broad audience.

The NICU Readmissions metric assesses the State-level readmission rate at 7, 14, 30, and 90 days after a stay in the Neonatal Intensive Care Unit (NICU). The optimal measure will adjust for differences in risk by infants of different birth weights and/or gestational ages. Inclusion of additional variables in the risk-adjustment model will allow users to isolate the impact of inpatient NICUs and the outpatient providers for observed variations in readmission rates.

1.D. Measure Owner

The Children's Hospital of Philadelphia (CHOP).

1.E. National Quality Forum (NQF) ID (if applicable)

NQF ID No. 2893

1.F. Measure Hierarchy

Please note here if the measure is part of a measure hierarchy or is part of a measure group or composite measure. The following definitions are used by AHRQ:

1. **Please identify the name of the collection of measures to which the measure belongs (if applicable). A collection is the highest possible level of the measure hierarchy. A collection may contain one or more sets, subsets, composites, and/or individual measures.**

   Neonatal Intensive Care All-Condition Readmissions.

2. **Please identify the name of the measure set to which the measure belongs (if applicable). A set is the second level of the hierarchy. A set may include one or more subsets, composites, and/or individual measures.**

   Neonatal Intensive Care All-Condition Readmissions with Gestational Age.

3. **Please identify the name of the subset to which the measure belongs (if applicable). A subset is the third level of the hierarchy. A subset may include one or more composites, and/or individual measures.**

   Not applicable.

4. **Please identify the name of the composite measure to which the measure belongs (if applicable). A composite is a measure with a score that is an aggregate of scores from other measures. A composite may include one or more other composites and/or individual measures. Composites may comprise component measures that can or cannot be used on their own.**

   Not applicable.

1.G. Numerator Statement

Number of infants admitted to the NICU during their initial birth hospitalization who were readmitted to the hospital within 7, 14, 30, or 90 days of discharge. These time periods are assessed cumulatively, such that readmissions occurring within prior time periods are included.

1.H. Numerator Exclusions

Infants with a specified congenital anomaly as described in Table 1 (see Supporting Documents).

1.I. Denominator Statement

Number of eligible newborns discharged from the NICU.

1.J. Denominator Exclusions

Infants with a specified congenital anomaly as described in Table 1 (see Supporting Documents).

1.K. Data Sources

Check all the data sources for which the measure is specified and tested.

Administrative data (e.g., claims data).

If other, please list all other data sources in the field below.

Not applicable.

Section 2: Detailed Measure Specifications

Provide sufficient detail to describe how a measure would be calculated from the recommended data sources, uploading a separate document (+ Upload attachment) or a link to a URL. Examples of detailed measure specifications can be found in the CHIPRA Initial Core Set Technical Specifications Manual 2011 published by the Centers for Medicare & Medicaid Services. Although submission of formal programming code or algorithms that demonstrate how a measure would be calculated from a query of an appropriate electronic data source are not requested at this time, the availability of these resources may be a factor in determining whether a measure can be recommended for use.

Eligible Population: Indication of NICU stay in the first 30 days of life without a specified congenital anomaly.
Numerator Statement: Number of infants admitted to the NICU during their initial birth hospitalization who were readmitted to the hospital within 7, 14, 30, or 90 days of discharge, assessed cumulatively.
Denominator Statement: Number of eligible newborns discharged from the NICU.
Adjusted Metric: Rates are adjusted for race, gender, and complications. Gestational age is also included in the adjustment. Note that these variables may not be available in all datasets. The adjusted results of readmissions using all of these variables are described as Adjusted Model with complications of prematurity, which has the greatest face validity for practicing physicians, based on data that support the idea that each of these variables contributes in some way to a patient's risk for readmission. Medical complication variables and/or gestational age may be excluded (Adjusted Model) from analyses that focus solely on the overall quality of care of the NICU; some variation in readmission rates may occur because of differential rates of complications at the hospital level. Gestational age and birth weight may be imputed using logistic regression with five imputations. The variables used to impute were length of stay, days per NICU CPT code, complications, and whether the patient ever entered the well-baby grower care (CPT code). After imputing, models and rates were determined by stratifying by imputation then combining to determine final values.
Supplement: Codes to identify NICU stay and complications and Tables 1-5 (see Supporting Documents) with more information.

Section 3. Importance of the Measure

In the following sections, provide brief descriptions of how the measure meets one or more of the following criteria for measure importance (general importance, importance to Medicaid and/or CHIP, complements or enhances an existing measure). Include references related to specific points made in your narrative (not a free-form listing of citations).

3.A. Evidence for General Importance of the Measure

Provide evidence for all applicable aspects of general importance:

- **Addresses a known or suspected quality gap and/or disparity in quality (e.g., addresses a socioeconomic disparity, a racial/ethnic disparity, a disparity for Children with Special Health Care Needs (CSHCN), a disparity for limited English proficient (LEP) populations).**
- **Potential for quality improvement (i.e., there are effective approaches to reducing the quality gap or disparity in quality).**
- **Prevalence of condition among children under age 21 and/or among pregnant women.**
- **Severity of condition and burden of condition on children, family, and society (unrelated to cost).**
- **Fiscal burden of measure focus (e.g., clinical condition) on patients, families, public and private payers, or society more generally, currently and over the life span of the child.**
- **Association of measure topic with children's future health – for example, a measure addressing childhood obesity may have implications for the subsequent development of cardiovascular diseases.**
- **The extent to which the measure is applicable to changes across developmental stages (e.g., infancy, early childhood, middle childhood, adolescence, young adulthood).**

Special Healthcare Needs

Preterm births account for 11-12 percent of all live births in the United States. Readmissions are particularly prevalent among premature infants, who have been shown to have an approximately three-fold increase in risk of hospital admissions after discharge across all time frames compared to term infants, with higher rates in infants of younger gestational age (Escobar, Joffe, Gardner, et al., 1999; Ray, Lorch, 2013). Infants with complications or other health conditions, such as bronchopulmonary dysplasia (BPD) and necrotizing enterocolitis (NEC), also experience higher rates of readmission (Lorch, Baiocchi, Silber, et al., 2010; Morris, Gard, Kennedy, 2005).

Race/Ethnicity

Issues surrounding NICU readmissions are particularly relevant to the African American community, as a larger proportion of babies born to black mothers are premature, even after adjusting for income, education level, and socioeconomic status (Morris, et al., 2005). Additional studies have found higher rates of readmission among black and Hispanic babies (Berry, Toomey, Zaslavsky, et al., 2013; Kuzniewicz, Parker, Schnake-Mahl, et al., 2013). Additionally, the increased prevalence of jaundice in the Asian population likewise increases their risk of readmission (Kuzniewicz, et al., 2013; Paul, Lehman, Hollenbeak, et al., 2006).

Potential for Quality Improvement

Preventing hospital readmissions is an area of emphasis for insurers and public health professionals because hospital readmissions may represent either poor quality of care during the hospitalization or poor discharge planning and transition of care from inpatient to outpatient

providers (Berry, et al., 2013; Escobar, Greene, Hulac, et al., 2005; Morse, Hall, Fieldston, et al., 2011; Profit, McCormick, Escobar, et al., 2007; Lorch, et al., 2010; Tsai, Joynt, Orav, et al., 2013).

Readmissions can be used to define or measure the effectiveness of infant discharge criteria (Kotagal, Perlstein, Gamblian, et al., 1995; Seki, Iwasaki, An, et al., 2011), or the effect of performance-based quality metrics (Paul, et al., 2006). Analysis of readmissions on longer time intervals can also be used to assess quality of outpatient care, or the dyad of inpatient and outpatient care providers (Lorch, et al., 2010). These methods may also provide insight into the overall structure of the healthcare system for managing the care of the prematurely-born infant.

Increasing access to and continuity of health insurance for mothers and infants, identification of maternal risk factors (young age, first-time pregnancy, diabetes, hypertension, etc.), and targeting mothers for specific education around the needs of their premature infant can also potentially reduce readmission rates (Bakewell-Sachs, Medoff-Cooper, Escobar, et al., 2004; Paul, et al., 2006; Ray, Escobar, Lorch, 2010).

Severity and Burden of Condition

The costs and stresses of an infant admitted to the NICU can have a profound effect on family well-being. Several studies have found elevated levels of hostility, anxiety, and/or depression among parents of NICU infants (Carter, Mulder, Bartram, et al., 2005; Doering, Moser, Dracup, 2000). These alterations in parental attitudes and family well-being can produce long-term effects on the development of the child and family. Caring for a premature infant also requires more maternal/family education, a failure of which can further increase risk of readmission (Bakewell-Sachs, Gennaro, 2004; Paul, et al., 2006).

Fiscal Burden

Increased hospitalizations contribute to higher healthcare costs and utilization (Kirkby, Greenspan, Kornhauser, et al., 2007; Wade, Lorch, Bakewell-Sachs, et al., 2008). Costs and resource utilization by preterm, low birth weight infants (those at the highest risk of readmission) are substantially higher ($224,000 at 500-600 g, vs. $1,000 at 3000g or greater) (Gilbert, Nesbitt, Danielsen, 2003; Russell, Green Steiner, et al., 2007). Although the initial NICU admission is the highest-cost, each readmission has an average claim of approximately $8,468 (Underwood, Danielsen, Gilbert, 2007). Premature infants and infants with morbidities have been shown to have a higher number of office visits (especially for higher-cost non-well child visits) and a greater number of prescriptions (Wade, et al., 2008). Estimated rates of outpatient visits for the very-low-birth weight infants range from over five visits/month during the first 3 months post-discharge for infants born at a gestational age under 26 weeks, to an average of 1.5 visits/month overall for the first year after discharge for infants born at a gestational age under 32 weeks.

Additionally, the extra care and attention required by a premature of NICU infant makes it more difficult for the parents to maintain a two-income household (Gennaro, 1996). Finally, increased risk of social and behavioral problems associated with prematurity can have lingering effects over the entire life of the child. Early pediatric interventions have been shown to reduce these risks.

Future Health

Although readmissions are not themselves associated with a child's future health, they are more common among infants with health problems that require special attention, such as prematurity, low birth weight, and other neonatal morbidities. Readmissions as a measure can help ensure that these babies are receiving the routine and preventive care necessary to improve their health outcomes, as quality outpatient and primary pediatric care will reduce preventable readmissions.

Applicability of Measure Across Developmental Stages

Premature infants and infants with morbidities have been shown to have delayed achievement of physiologic milestones such as respiration and feeding (Bakewell-Sachs, et al., 2009). In multiple studies, including multi-study reviews, of outcomes for babies born preterm versus term, preterm infants had significantly lower cognitive scores, educational ability, and need for medical interventions, as well as an increased relative risk of developing ADHD (Bhutta, Cleves, Casey, et al., 2002; Chapieski, Evankovich, 1997; McGowan, Alderdice, Holmes, et al., 2010). Several early intervention programs aimed at reducing the developmental delay of preterm infants via parental education, family support, and pediatric follow-up have shown improved cognitive scores (Brooks-Gunn, Klebanov, Liaw, et al., 1993).

3.B. Evidence for Importance of the Measure to Medicaid and/or CHIP

Comment on any specific features of this measure important to Medicaid and/or CHIP that are in addition to the evidence of importance described above, including the following:

- **The extent to which the measure is understood to be sensitive to changes in Medicaid or CHIP (e.g., policy changes, quality improvement strategies).**
- **Relevance to the Early and Periodic Screening, Diagnostic and Treatment benefit in Medicaid (EPSDT).**
- **Any other specific relevance to Medicaid/CHIP (please specify).**

Readmission rates have been shown to be tightly linked not only to inpatient facility but also to outpatient care (Lorch, et al., 2010). Insurance enrollment and continuity are important for access and timely care for a premature infant. Outpatient care can identify and address health problems before they reach the point of requiring hospital admission. For these reasons, a NICU readmissions metric should be sensitive to changes in Medicaid/CHIP policies that are designed to increase take-up and retention by reducing barriers to enrollment and redetermination. In addition, policies focused on improving infant discharge criteria and outpatient quality should also improve the measured readmission rate.

Because of the slowed development and increased potential for health complications or behavioral problems among premature/low birthweight infants, the EPSDT program will be integral in early identification and treatment of problems in these at-risk babies and children. Increased focus on regular preventive care may reduce the number of unnecessary hospital readmissions and ensure improved overall quality of outpatient care received by these infants (D'Agostino, Passarella, Saynisch, et al., 2015).

3.C. Relationship to Other Measures (if any)

Describe, if known, how this measure complements or improves on an existing measure in this topic area for the child or adult population, or if it is intended to fill a specific gap in an existing measure category or topic. For example, the proposed measure may enhance an existing measure in the initial core set, it may lower the age range for an existing adult-focused measure, or it may fill a gap in measurement (e.g., for asthma care quality, inpatient care measures).

This measure fills in the gaps left by other readmission measures, particularly the all-cause pediatric readmission metric proposed by the Boston Children's group.

Section 4. Measure Categories

CHIPRA legislation requires that measures in the initial and improved core set, taken together, cover all settings, services, and topics of health care relevant to children. Moreover, the legislation requires the core set to address the needs of children across all ages, including services to promote healthy birth. Regardless of the eventual use of the measure, we are interested in knowing all settings, services, measure topics, and populations that this measure addresses. These categories are not exclusive of one another, so please indicate "Yes" to all that apply.

Does the measure address this category?

a. **Care Setting – ambulatory:** No.
b. **Care Setting – inpatient:** Yes.
c. **Care Setting – other – please specify:** No.
d. **Service – preventive health, including services to promote healthy birth:** No.
e. **Service – care for acute conditions:** No.
f. **Service – care for children with special health care needs/chronic conditions:** Yes.
g. **Service – other (please specify):** No.
h. **Measure Topic – duration of enrollment:** No.
i. **Measure Topic – clinical quality:** Yes.
j. **Measure Topic – patient safety:** No.
k. **Measure Topic – family experience with care:** No.
l. **Measure Topic – care in the most integrated setting:** Yes.
m. **Measure Topic other (please specify):** No.
n. **Population – pregnant women:** No.
o. **Population – neonates (28 days after birth) (specify age range):** Yes; 0-28 days.
p. **Population – infants (29 days to 1 year) (specify age range):** Yes; 29-244 days.
q. **Population – pre-school age children (1 year through 5 years) (specify age range):** No.
r. **Population – school-aged children (6 years through 10 years) (specify age range):** No.
s. **Population – adolescents (11 years through 20 years) (specify age range):** No.

t. **Population – other (specify age range):** No.
u. **Other category (please specify):** Not applicable.

Section 5. Evidence or Other Justification for the Focus of the Measure

The evidence base for the focus of the measures will be made explicit and transparent as part of the public release of CHIPRA deliberations; thus, it is critical for submitters to specify the scientific evidence or other basis for the focus of the measure in the following sections.

5.A. Research Evidence

Research evidence should include a brief description of the evidence base for valid relationship(s) among the structure, process, and/or outcome of health care that is the focus of the measure. For example, evidence exists for the relationship between immunizing a child or adolescent (process of care) and improved outcomes for the child and the public. If sufficient evidence existed for the use of immunization registries in practice or at the State level and the provision of immunizations to children and adolescents, such evidence would support the focus of a measure on immunization registries (a structural measure).

Describe the nature of the evidence, including study design, and provide relevant citations for statements made. Evidence may include rigorous systematic reviews of research literature and high-quality research studies.

The topic of hospital readmissions has been an area of particular interest for State and national policy agencies, health insurers, and caregivers because of the high costs, both financial and to families, associated with them. So-called "preventable" readmissions, described that way because ostensibly some change in practice at either the inpatient or outpatient level could have prevented the readmission, may provide insight into care practices that could limit hospitalizations. In pediatric medicine, there are groups of high-risk patients for whom hospital readmissions occur frequently. For example, while the estimated readmission rate within 30 days among the 2.4 million admissions annually in the United States is approximately 6.5 percent (Berry, et al., 2013; Yu, Wier, Elixhauser, 2011), many conditions such as surgery, sickle cell disease, and prematurity have rates between 15 and 20 percent (Berry, 2014; Ray, Lorch, 2013; Underwood, et al., 2007; Wade, et al., 2008). Another group at risk for frequent readmissions comprises children discharged from the NICU. Premature infants have an approximately three-fold increase in risk of hospital readmission after discharge compared to term infants, with higher rates in infants of younger gestational age (Ray, et al., 2013). These hospital readmissions contribute to the higher healthcare costs and utilization seen in prematurely-born infants (Underwood, et al., 2007; Wade, et al., 2008). A limited number of studies show variation in readmission rates in one Canadian province (Martens, Derksen, Gupta, 2004) and in a small number of hospitals (Morris, et al., 2005). Variation in other pediatric specialties has also been shown (Berry, et al., 2013; Czaja, Hosokawa, Henderson, 2013). For the preterm population, we

have demonstrated substantial variation in the unadjusted readmission rates among all California delivery hospitals regardless of time period examined with a standardized difference that ranged from 578-683 percent. The large variation between hospitals persisted after adjusting for gestational age and sociodemographic factors, with standardized differences again ranging between 660-724 percent (Lorch, Passarella, Zeigler, 2014).

There are a number of potential factors associated with higher, or lower, rates of hospital readmissions. Differences in rates may result from differences in illness severity (Lorch, et al., 2010) or other patient characteristics across hospitals (Ambalavanan, Carlo, McDonald, et al., 2011; Lorch, et al., 2010; Ray, et al., 2010).

Readmission rates of preterm infants are approximately 3- to 6-fold as high as term infants, with the highest rates found in infants of younger gestational age (Ray, et al., 2013). Data from numerous adult studies show that infants of lower socioeconomic status have higher rates of hospital readmissions (Srivastava, Keren, 2013), leading to higher rates of readmission at safety-net hospitals for surgical procedures (Hoehn, Wima, Vestal, et al., 2015) and congestive heart failure (Joynt, Jha, 2010). Other studies show associations between readmission rates within ZIP codes and rates of poverty and other measures of social deprivation (Beck, Simmons, Huang, et al., 2012; Liu, Pearlman, 2009; Ray, Lorch, 2012). Family socioeconomic status, as measured by insurance status (Auger, Kahn, Davis, et al. 2013; Bloomberg, Trinkaus, Fisher Jr, et al., 2003; Coller, Klitzner, Lerner, et al., 2013; Liu, Pearlman, 2009; Rice-Townsend, Hall, Barnes, et al., 2013) and financial hardship (McGregor, Reid, Schulzer, et al., 2006), is associated with readmission risk.

Children with publicly-financed insurance have higher rates of readmission, with prematurely-born infants in some States having rates as high as 30 percent (Lorch, et al., 2014). As case mix differs substantially between hospitals and providers, it is important that the readmission metric be risk-adjusted for all healthcare groupings smaller than the State level (Lorch, Baiocchi, Ahlberg, et al., 2012).

Readmissions may also result from differences in outpatient providers and practices after discharge. For example, recent data found increased rates of hospital readmission for preterm infants receiving care at outpatient providers with a higher use of unnecessary antibiotics or other medications (Lorch, et al., 2010). Coller and colleagues (2014), in a systematic review of pediatric hospitals, found that the primary method of preventing readmissions in children with complex health issues was improved continuity and coordination of care. When studies account for all aspects of the healthcare system, both inpatient and outpatient, the results may inform observed inter-hospital differences in readmission rates shown by our data and others using Medicare (Herrin, St. Andre, Kenward, et al., 2015) or individual hospital data (McMillan, Meier, Winer, et al., 2015).

Studies exploring the association of hospital readmission rates and overall measures of quality at the hospital level have found conflicting and sometimes surprising results. Many studies have failed to show an association between hospital complication rates and readmission rates (Brown, Chang, Zhou, et al., 2014; Horwitz, Lin, Herrin, et al., 2015; Yeh, Rosenfield, Zelevinsky, et al.,

2012). We show similar results for rates of BPD, NEC, and ROP. Prior work has also suggested that higher quality NICUs have higher volumes and lower complication rates than their peers (Phibbs, Bronstein, Buxton, et al., 1996; Phibbs, Baker, Caughey, et al., 2007). For readmissions, hospital volume has shown conflicting results, with some studies suggesting that high volume hospitals have lower rates of readmission (Brown, et al., 2014; Tsai, et al., 2013), and other studies finding the opposite association (Horwitz, et al., 2015; Joynt, Jha, 2011). As we and others have argued (Lorch, 2013; Krumholz, Lin, Keenan, et al., 2013) this lack of association with some measures of hospital quality may reflect the theory that readmission measures a different aspect of care – the discharge/transition to home process, including education of the family – that fails to affect other quality measures such as complication or mortality rates (Coller, Nelson, Slansky, et al., 2014).

Key factors that may affect the structures or processes of care that the readmission metric assesses are (a) the cohort of patients included in the study and (b) the timeframe for readmission after hospital discharge. Compared to other readmission measures, including only infants admitted to the NICU allows us to reduce the noise within the measure because of differences in admission criteria between hospitals. All infants born under 34 weeks of gestational age are included when gestational age is in the data source or can be imputed. Ideally, gestational age is known when determining sample inclusion. The Centers for Medicare & Medicaid Services (CMS) uses a 30-day timeframe for their readmission measures (CMS, 2013). However, there are no studies to support this timeframe over shorter (Escobar, et al., 1999) or longer evaluation periods used in prior work (Lorch, et al., 2010; Ray, et al., 2013). Shorter time periods may better reflect the care delivered by the inpatient hospital course, suggested by our reliability data shown in the testing attachment (see Supporting Documents), whereas longer time periods may reflect either care of outpatient providers or the overall illness severity of these infants (Lorch, et al., 2010). Thus, we define the metric with rehospitalization for any reason within 7, 14, 30, 90, and 365 days after discharge from the birth hospitalization, depending on the use.

Overall, then there have been no comprehensive studies of other structural metrics or processes of care associated with differences in readmission rates, particularly at the level of the NICU. However, the observed substantial hospital- and State-level variation previously reported (Lorch, et al., 2014) after adjusting for patient-level and clinical factors supports the idea that readmission variation reflects some part of a hospital's ability to transition care from the inpatient to outpatient setting, along with the outpatient provider's ability to accept and manage the patient. Specific areas that these measures may assess include (1) specific transition of care policies and protocols; (2) education of families; (3) choice of outpatient provider; (4) communication between inpatient and outpatient provider; (5) access to outpatient care (Misky, Wald, Coleman, 2010); and/or (6) quality of outpatient provider in reducing readmission risk.

5.B. Clinical or Other Rationale Supporting the Focus of the Measure (optional)

Provide documentation of the clinical or other rationale for the focus of this measure, including citations as appropriate and available.

Not applicable.

Section 6. Scientific Soundness of the Measure

Explain the methods used to determine the scientific soundness of the measure itself. Include results of all tests of validity and reliability, including description(s) of the study sample(s) and methods used to arrive at the results. Note how characteristics of other data systems, data sources, or eligible populations may affect reliability and validity.

6.A. Reliability

Reliability of the measure is the extent to which the measure results are reproducible when conditions remain the same. The method for establishing the reliability of a measure will depend on the type of measure, data source, and other factors.

Explain your rationale for selecting the methods you have chosen, show how you used the methods chosen, and provide information on the results (e.g., the Kappa statistic). Provide appropriate citations to justify methods.

For the purposes of this report, we define the reliability of the metric as the ability to produce consistent as well as precise results under similar conditions. Specifically we determined whether the readmission rates and the rankings based on these rates were consistent upon repeated sampling.

Inter-year reliability for each measure was calculated using one-way random effects ANOVA models for States using Medicaid Analytic Extract (MAX) data.

Reproducibility of the results was calculated using Spearman-Brown statistics. Briefly, a 50 percent random sample of patients was drawn from each healthcare unit (State), and risk-adjustment models were calculated. Then, a second 50 percent sample was chosen, and Spearman rank sum correlation coefficients were calculated. This metric assesses the influence of changes to the case mix of a State, where one assumes that the 50 percent sample provides an "alternative" insight into the measured readmission rates at each State.

The values in Tables 6 and 7 (see Supporting Documents) suggest that for State-level data, the measure has modest inter-year reliability that is highest the further one measures after discharge, with similar improved intra-year reliability as measured by the Spearman-Brown reliability measure as the length of time after discharge increases. Such reliability is similar to that suggested in other work from adult studies (e.g., Press, Scanlon, Ryan, et al., 2013).

6.B. Validity

Validity of the measure is the extent to which the measure meaningfully represents the concept being evaluated. The method for establishing the validity of a measure will depend on the type of measure, data source, and other factors.

Explain your rationale for selecting the methods you have chosen, show how you used the methods chosen, and provide information on the results (e.g., R2 for concurrent validity).

Risk Adjustment

In order to utilize NICU Readmissions to measure State or hospital performance, the measure must be effectively risk-adjusted to meet the face validity needs of clinicians. As described in the data availability section, our primary dataset, the Medicaid Analytic eXtract, had a high degree of missingness in the gestational age and birth weight variables. As a result, we present information from two potential approaches. First, we use information from infants with available gestational age or birth weight. These results should mirror those obtained when vital statistics are linked to Medicaid data that are only available in a limited number of States (the number of which precludes formal analysis at the present time). Second, we multiply imputed gestational age using the technique described in Section 2 of this report. The readmission rates using the imputed gestational age technique are presented in Table 5 (see Supporting Documents) only, as the rates of missingness are extreme. To avoid bias, testing of the metric was limited to data with known, rather than imputed gestational age. No reliability or validity testing was performed on the imputed data.

For risk adjustment, we include characteristics of the infant that may increase the risk of hospital readmission after discharge from the NICU based on prior work: gestational age, birth weight, gender, and insurance status (Lorch, et al., 2010; Lorch, et al., 2012; Ray, Lorch, 2013). Gestational age and birth weight are specifically captured in birth certificate records. We also assessed how risk-adjusted hospital rates changed when we included common complications of preterm birth associated with readmissions in prior work, and captured using ICD-9CM codes in hospital administrative records: BPD, NEC, ROP, and IVH. Including these factors is controversial when assessing a facility's quality, though, because improved inpatient quality of care may result in lower mortality rates, and thus the potential for higher complication rates (Jensen, Lorch, 2015).

However, including the individual complications allows for the isolation of the readmission rates at a given hospital controlling for complications of care, and thus improves assessment of the factors that explicitly are related to the readmission of the preterm infant. Gestational age, birth weight, sociodemographic information, and complications of premature birth were available in over 98 percent of records in the California State data and have been used in prior work from this dataset (Lorch, et al., 2012; Phibbs, et al., 2007).

Results

Unadjusted variation. Among infants with a gestational age between 23 and 34 weeks, there was substantial variation in the unadjusted readmission rates among States regardless of time period examined, with a standardized difference that ranged from 334 percent (7-day readmission) to 383 percent (365-day readmission).

Adjusted variation. The large variation between hospitals persisted after adjusting for gestational age and sociodemographic factors, with standardized differences again ranging

between 341-395 percent. Adding common complications of preterm birth to the risk adjustment model made little difference to the readmission rates, with the mean change in rates being 0 percent for readmissions more than 14 days after discharge, with only a 2 percent decline in 7-day readmission rates.

Individual logistic regression models estimating the risk of readmission for each timeframe can be seen with and without adjusting for complications in Tables 8a-e and 9a-e (see Supporting Documents).

Predictive Validity: Readmissions and Complication Rates

We present two tests of the validity of the measure. First, we examine the correlation between readmission rates and hospital volume. Correlation with volume was performed based on previous work suggesting a volume-outcome association with other potential measures of NICU quality, such as mortality rates (Phibbs, et al., 2007; Rogowski, Horbar, Staiger, et al., 2004), and thus higher volumes are a structural measure of neonatal intensive care. This work parallels other work in the literature that suggests that higher volume hospitals have improved outcomes, likely secondarily to seeing more patients and implementing processes of care to improve their outcomes. We hypothesize that there should be a larger association between hospital volume and readmission rates compared to complication rates.

Second, we examine other hypothesized measures of quality that may assess a different aspect of NICU quality. These structural and outcome measures include risk-adjusted rates of common complications of premature birth where variation is known, such as BPD, IVH, NEC, and ROP. Complication rates have been suggested by the Institute of Medicine as appropriate surrogates of hospital quality. These complications have also been demonstrated to be important risk factors for the development of long-term neurodevelopmental delay and cerebral palsy (Schmidt, Asztalos, Roberts, et al., 2003). However, the processes of care that may reduce the development of complications throughout the hospital stay (improved respiratory ventilator management, improved feeding programs, hand hygiene programs) may be only modestly associated with processes of care that improve readmission rates (such as improved transitions of care, improved education of families, and the like). These intermediate process measures are not available in any large scale population-based dataset. If we find an association between readmission rates and neonatal complications, it would call into question whether the extra time needed to quantify readmission rates should be undertaken by hospitals, insurers, State agencies, and other bodies interested in assessing the quality of neonatal intensive care (for further information on this topic, see Table 10, State Volume Validity Testing, in Lorch, et al., 2014).

All complication rates reported in Table 11 (see Supporting Documents) are risk-adjusted using the same model as readmission rates. Spearman correlation coefficients are presented; similar results were found with Pearson's correlation coefficients.

For State-level comparisons, there was no volume-outcome association. We found modest to very strong correlations between readmission rates, but poor to no correlations between risk adjusted complication rates and both adjusted and risk-adjusted readmission rates except for BPD and early readmission rates.

Section 7. Identification of Disparities

CHIPRA requires that quality measures be able to identify disparities by race, ethnicity, socioeconomic status, and special health care needs. Thus, we strongly encourage nominators to have tested measures in diverse populations. Such testing provides evidence for assessing measure's performance for disparities identification. In the sections below, describe the results of efforts to demonstrate the capacity of this measure to produce results that can be stratified by the characteristics noted and retain the scientific soundness (reliability and validity) within and across the relevant subgroups.

7.A. Race/Ethnicity

For these analyses, race and ethnicity were determined based on the race/ethnicity variable reported in the MAX data and classified based on Office of Management and Budget guidelines. White was defined as white, not of Hispanic origin. Black was defined as black, not of Hispanic origin. For Hispanic, we combined children reported as Hispanic or Latino and Hispanic or Latino and one or more races. Other included American Indian, Alaskan Native, Asian, Pacific Islander, and children with missing race/ethnicity. We stratified the readmissions metric by enrollee race/ethnicity. Readmission rates did not vary substantially between races/ethnicities at the State level, with the exception of a slight trend in higher rates in racial/ethnic minority patients 90 days and 365 days after discharge. This is similar to previous work from our group finding no real difference in readmission rates between children of different racial/ethnic backgrounds (Ray, Lorch, 2013);. Results are presented in Table 12: Readmission Rates Stratified by State and by Race/Ethnicity (see Supporting Documents).

7.B. Special Health Care Needs

Based on published peer-reviewed literature, we compiled a list of pediatric chronic conditions (see Supporting Documents for representative ICD-9 codes) where each condition was represented in all or most of the papers (Feudtner, Christakis, Connell, 2000; Feudtner, Hays, Haynes, et al., 2001; Fowler, Gallagher, Homer, 2001; Neuzil, Wright, Mitchel Jr, et al., 2000; Seferian, Lackore, Rahman, et al., 2006; Todd, Armon, Griggs, et al., 2006; Valentine, Neff, Park, et al., 2000).

Unsurprisingly, children with special healthcare needs were more likely than healthy children to have a readmission at all timepoints and across all States. State rankings were also fairly stable, with the same States tending to have higher or lower rates at each timepoint (Table 13; see Supporting Documents).

7.C. Socioeconomic Status

Socioeconomic measures at the individual or census-tract level are not included in the MAX data. Although 5-digit-zip code-based socioeconomic measures have significant limitations, we

performed analyses using three socioeconomic variables (percent with high school degree, percent with income below FPL, and income level) stratified by quartiles in order to demonstrate that these analyses are feasible (Kreiger, Williams, Moss, 1997). These variables were abstracted from U.S. census 5-digit- zip code-level data and merged with the MAX data. If 9-digit-zip code data were available in MAX, these analyses would produce more robust and meaningful results.

As noted in the methods, these analyses were performed for the purposes of demonstrating feasibility and not for the purposes of assessing the significance of associations. The ensuing summary table is provided to assist readers in reviewing the large volume of tabulated results that underscore the limited utility of 5-digit zip code level socioeconomic indicators in these analyses. As can be seen, high- and low-performing States performed similarly across SES quartiles. Although there was an association between higher socioeconomic status and lower readmissions, the difference between areas within various quartiles of SES was low and not consistent across States (see Tables 14-16; see Supporting Documents).

7.D. Rurality/Urbanicity

A crosswalk was performed between the MAX data using the 2010 Census urban and rural classification. There are two types of urban areas: urbanized areas have 50,000 or more people residing in the area; urban clusters have at least 2,500 and fewer than 20,000 people residing in the area. Rural encompasses all population, housing, and territory not included within an urban area.

In general, there was relative little variation between the geographic categories within each State. Exceptions included Idaho, where rural was significantly lower than urban cluster or urbanized area across most timepoints, and New Jersey, where rural was significantly higher (Table 17, see Supporting Documents).

7.E. Limited English Proficiency (LEP) Populations

LEP data are not available in the MAX dataset; thus, we were unable to pursue these analyses.

Section 8. Feasibility

Feasibility is the extent to which the data required for the measure are readily available, retrievable without undue burden, and can be implemented for performance measurement. Using the following sections, explain the methods used to determine the feasibility of implementing the measure.

8.A. Data Availability

1. What is the availability of data in existing data systems? How readily are the data available?

The NICU Readmissions measure is designed to be used with administrative datasets, birth records linked to administrative datasets, or electronic health record (EHR) data. Administrative data in the form of the Medicaid Analytic eXtract is already available nationwide, derived from the Medicaid Statistical Information System, which is collected at the individual level by State Medicaid programs and standardized into MAX for inter-State comparison by CMS. CPT codes allow for the identification of all inpatient admissions, whether to the NICU or to the general pediatrics floors. Insurance data allow for the calculation of readmission rates using different hospitals, which is critical for a valid measure (Khan, Nakamura, Zaslavsky, et al., 2015). The admission, then, can be validated using same-time observations in the inpatient data fields using ICD-9-CM or ICD-10 codes. This dataset is already in use at the Federal and State levels to assess Medicaid/CHIP program performance.

MAX data do not include specific fields for birth weight or gestational age. As a result, the wide variation in hospital and State use of specific ICD-9-CM or ICD-10 codes to identify patients within specific birth weight or gestational age categories limits the ability to adequately risk adjust the readmission metrics without additional linkage of data (Lorch, et al., 2014). Recent attempts have been made within specific States (for example, Louisiana) to link birth certificate and vital statistics data to MAX data to improve the assessment of gestational age and birth weight without requiring the complex statistical methods described above. No such research dataset is available as of yet.

No attempts have been made to use EHR data for such a project. Such data would need to include inpatient data from not only the health system of the infant, but also from all potential hospitals where an infant could be admitted – both from the neonatal intensive care units, to allow for accurate identification of risk-adjustment variables, and after discharge, to allow for accurate quantification of the readmission rates. To do this will require either (1) population based datasets from all payers and providers, similar to the all-payer datasets seen in such States as Massachusetts, Maine, New Hampshire, and Colorado; or (2) better communication and documentation of such healthcare encounters within the EHR by providers, to document an inpatient visit or an ED visit and the reasons for such a visit.

2. If data are not available in existing data systems or would be better collected from future data systems, what is the potential for modifying current data systems or creating new data systems to enhance the feasibility of the measure and facilitate implementation?

Under the assumption that MAX data are ideal, due to the fact that these data are already collected in and made uniform across all States, there nevertheless are several areas where collection could be improved.

The first challenge to using MAX is that managed care claims data are often absent, and when they are included, the number of patients and encounter claims varies tremendously by State. For our analyses, this means we had to select States that (1) had less than 10 percent of their Medicaid patients enrolled in a comprehensive managed care plan for the years of analysis; (2) had their managed care system classified as a Primary Care Case Management delivery system, whose claims are included in MAX, or (3) had external validation (via reports by Mathematica) of the completeness and accuracy of their managed care encounter records in the MAX dataset.

To completely rely on MAX data for such reporting would require improved patient-level information. Second, not all States report data from patients enrolled in the State Children's Health Insurance Program (CHIP). While claims from States with an M-CHIP Medicaid expansion program are available in MAX, claims from States with a separate S-CHIP program, typically overseen by a State managed care insurer, are not. To mitigate this issue, we selected States with S-CHIP enrollment of less than 15 percent of all Medicaid/CHIP children, except for Idaho (increased to 40 percent in 2008) and Montana (20-25 percent between 2006-2008), whose data were included for geographic diversity. After applying these criteria, we had data from 18 States. Although managed care data collection is improving each year, there have not yet been steps taken to incorporate claims data from separate S-CHIP programs into MAX, and so in States where S-CHIP programs are large, substantial numbers of children are eliminated from analysis.

In MAX, some infants are missing birth hospital from their record. This issue frequently occurred because one or more of the inpatient hospitalization records during the birth hospitalization was not linked to the MAX record. The majority of these cases occurred when the infant was hospitalized outside the State of the infant's or mother's Medicaid enrollment. The magnitude of this issue varied among the States, with the greatest impact seen in States with large obstetric or pediatric hospitals immediately across State lines, such as Illinois (St. Louis, MO), New Jersey (Philadelphia, New York City), and Kentucky (Cincinnati). The reason for this is that States currently collect data independently of each other and only from the hospitals within their State. Efforts to share data across State lines would dramatically reduce this problem.

Appropriate risk adjustment by gestational age and/or birth weight is extremely important to achieve a meaningful NICU readmissions measure. These data are missing in an extremely high percentage of MAX records. Gestational age is missing to a much larger degree than birth weight, with gestational age missing in 46-81 percent of patients and birth weight missing in 18-61 percent of patients, although the data available for birth weight do not allow for more than three categories (< 1500 grams, 1500-2500 grams, > 2500 grams). Ideally, these data would either be recorded in the administrative records, or MAX could include, or be linked to, birth certificate data. In short, use of MAX data and other State-level existing datasets will require improved clinical data collection and the linkage of data across State lines for States with large numbers of patients who cross State lines to receive care, to allow for appropriate assessment of the readmission metric.

The final challenge with MAX data is the appropriate identification of providers. Data prior to 2008 used inconsistent hospital and provider identification, without a validated crosswalk. Thus, no hospital data were constructed from these datasets.

8.B. Lessons from Use of the Measure

1. Describe the extent to which the measure has been used or is in use, including the types of settings in which it has been used, and purposes for which it has been used.

This is a new measure that has not been used.

2. If the measure has been used or is in use, what methods, if any, have already been used to collect data for this measure?

This is a new measure that has not been used.

3. What lessons are available from the current or prior use of the measure?

This is a new measure that has not been used.

Section 9. Levels of Aggregation

CHIPRA states that data used in quality measures must be collected and reported in a standard format that permits comparison (at minimum) at State, health plan, and provider levels. Use the following table to provide information about this measure's use for reporting at the levels of aggregation in the table.

For the purpose of this section, please refer to the definitions for provider, practice site, medical group, and network in the Glossary of Terms.

If there is no information about whether the measure could be meaningfully reported at a specific level of aggregation, please write "Not available" in the text field before progressing to the next section.

Level of aggregation (Unit) for reporting on the quality of care for children covered by Medicaid/ CHIP†:

State level* Can compare States

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Yes.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
This information is not yet available.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
This information is not yet available.

Other geographic level: Can compare other geographic regions (e.g., MSA, HRR)

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Medicaid or CHIP Payment model: Can compare payment models (e.g., managed care, primary care case management, FFS, and other models)

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Health plan*: Can compare quality of care among health plans.

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Provider Level
Individual practitioner: Can compare individual health care professionals

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Provider Level
Hospital: Can compare hospitals

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Provider Level
Practice, group, or facility:** Can compare: (i) practice sites; (ii) medical or other professional groups; or (iii) integrated or other delivery networks

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Section 10. Understandability

CHIPRA states that the core set should allow purchasers, families, and health care providers to understand the quality of care for children. Please describe the usefulness of this measure toward achieving this goal. Describe efforts to assess the understandability of this measure (e.g., focus group testing with stakeholders).

No efforts have been made as yet to assess the understandability of this measure with an external group of stakeholders. In theory, this measure can be used by purchasers, families, and healthcare providers to determine rates of NICU readmissions and potentially identify areas to focus prevention efforts to improve quality of care for children.

Section 11. Health Information Technology

Please respond to the following questions in terms of any health information technology (health IT) that has been or could be incorporated into the measure calculation.

11.A. Health IT Enhancement

Please describe how health IT may enhance the use of this measure.

In order for a NICU Readmissions metric to be maximally accurate, administrative datasets like MAX should increasingly incorporate the data necessary to adjust the measure, such as gestational age and birth weight. Currently, these variables can only be found in birth records and EHR data, which requires appropriate linkage of vital statistics data with either EHR data, hospital administrative data, or other population-based datasets. Such linkage typically will use probabilistic matching techniques given the limitations with either names (based on maternal last name for birth records, may change afterwards) or social security numbers (not typically present in birth records). However, our work and the work of others suggest well over 98 percent linkage of such data using probabilistic techniques, including dates of service, birth dates, and address information. Additionally, data must be collected across State lines for adequate assessment of the measure.

11.B. Health IT Testing

Has the measure been tested as part of an electronic health record (EHR) or other health IT system?

Yes.

If so, in what health IT system was it tested and what were the results of testing?

The measure has been tested using the MAX datasets available from RESDAC, the CMS Clearinghouse. The MAX data are compiled based on core MSIS information that States are required to report to CMS on an ongoing and regular basis.

11.C. Health IT Workflow

Please describe how the information needed to calculate the measure may be captured as part of routine clinical or administrative workflow.

Currently, the information required to compute this measure is captured by States in administrative Medicaid and CHIP files that are also reported to CMS on a quarterly basis. Hospitals, States, and insurance plans also collect birth record data, which can be very useful for adjusting this measure.

11.D. Health IT Standards

Are the data elements in this measure supported explicitly by the Office of the National Coordinator for Health IT Standards and Certification (ONC) criteria (see healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__standards_ifr/1195)?

Yes.

If yes, please describe.

Data elements in this measure are supported explicitly by the ONC criteria. The rules about electronically calculating all of the clinical and ambulatory quality measures specified by CMS for eligible hospitals and critical access hospitals will allow this measure to be validated. The

rule about the ability to retrieve patient demographic data—including preferred language, gender, race, ethnicity and date of birth—is essential for identifying disparities among these subgroups.

11.E. Health IT Calculation

Please assess the likelihood that missing or ambiguous information will lead to calculation errors.

There are three issues with the MAX dataset that are likely to lead to biased measurement, if not calculation errors. One, separate S-CHIP programs in States do not report their claims data to CMS; MAX contains only Medicaid and Medicaid Expansion enrollees. Two, managed care data are not reported consistently across all States. Finally, many MAX States are missing inpatient hospital records for some infants (see Section 8.A Data Availability in this report).

11.F. Health IT Other Functions

If the measure is implemented in an EHR or other health IT system, how might implementation of other health IT functions (e.g., computerized decision support systems in an EHR) enhance performance characteristics on the measure?

Because appropriate discharge is one of the primary factors associated with lowering readmissions, a computerized decision support system could improve performance on the NICU Readmission metric by improving standardization of and adherence to discharge criteria.

Additionally, better linking of an individual's health records via a comprehensive cross-provider EHR system could help physicians provide better post-discharge outpatient care and thus reduce preventable readmissions.

Section 12. Limitations of the Measure

Describe any limitations of the measure related to the attributes included in this CPCF (i.e., availability of measure specifications, importance of the measure, evidence for the focus of the measure, scientific soundness of the measure, identification of disparities, feasibility, levels of aggregation, understandability, health information technology).

Our tests of the measure show a high degree of variation across States and hospitals, even after our attempts to adjust for differences in NICU case mix. However, that implementation may be difficult due to missing data from administrative datasets in use at the State and Federal levels. Important adjusting variables, such as gestational age and birth weight, are not currently recorded consistently in MAX or like datasets, and thus accurate implementation of this metric will require new data collection, linkage with birth certificates, or more widespread and standardized use of an EHR for publicly reported measures.

More generally, data quality and completeness in MAX vary by State; some States do not report enrollment data, and none report claims for their State-funded (S-CHIP) programs. Similarly,

managed care claims are sometimes absent from MAX, and reported managed care data are not always validated before inclusion. We also found that inpatient records were missing in up to 20 percent of the identified claims in some States. We posit that this may occur because inpatient hospital administrative records that provide this information may not be linked or reported to MAX if the hospitalization occurs out of State. State-level rates of readmissions do not require these records, since CPT billing codes serve as a valid alternative and are present regardless of where the admission occurred. However, to construct hospital-level readmission rates, these records will become important to provide a complete picture of the variation in readmission rates across the hospitals that service patients of a given State Medicaid office.

An additional complication with the NICU Readmission measure, like any metric based on readmissions, is that it is very difficult to identify preventable readmissions from those that are necessary. There has not yet been a determination of the "optimal" level of readmissions in a State or hospital, so we cannot necessarily suggest that the lowest or highest observed rates are ideal, or where they fall relative to what we "should" observe. Many established quality metrics, including those of the CHIPRA Initial Core Set, strive for a 0 percent or 100 percent performance rate.

Identification of a baseline number of expected events is a much more difficult prospect and, thus, complicates the identification of outliers or underperformers. Additionally, we currently do not know what factors underlie the variation in readmission rates. While some of the variation could be related to the quality of care provided during the inpatient stay or discharge process, some might also be related to outpatient care quality or a child's access to services (Lamarche-Vadel, Blondel, Truffer, et al., 2004; Lorch, et al., 2010; Morris, et al., 2005) Lastly, some variation due to severity may persist even after risk adjustment.

Finally, even if a target rate were identified, it is unclear how much scope there would be for policy action aimed at improving performance at a given level of measurement. Even with financial incentives, State policymakers may not have much ability to improve the overall rate of readmissions in their State. Even at the hospital level, outpatient care has been shown to have a significant effect on readmission rates, possibly accounting for more variation than the NICU care quality (Lorch, et al., 2010).

Section 13. Summary Statement

Provide a summary rationale for why the measure should be selected for use, taking into account a balance among desirable attributes and limitations of the measure. Highlight specific advantages that this measure has over alternative measures on the same topic that were considered by the measure developer or specific advantages that this measure has over existing measures. If there is any information about this measure that is important for the review process but has not been addressed above, include it here.

Hospital readmissions have been an area of particular interest for State and national policy agencies, health insurers, and caregivers because of the high costs, both financial and to families,

associated with them. So-called “preventable” readmissions, so described because ostensibly some change in practice at either the inpatient or outpatient level could have prevented the readmission, may provide insight into care practices that could limit hospitalizations. In pediatric medicine, there are groups of high-risk patients for whom hospital readmissions occur frequently. For example, while the estimated readmission rate within 30 days among the 2.4 million admissions annually in the United States is approximately 6.5 percent (Berry, 2014; Yu, et al., 2011), many conditions such as surgery, sickle cell disease, and prematurity have rates between 15 and 20 percent (Berry, 2014; Ray, Lorch, 2013; Underwood, et al., 2007; Wade, et al., 2008). One other group at risk for more frequent readmissions comprises children discharged from the NICU. Premature infants have an approximately three-fold increase in risk of hospital readmission after discharge compared to term infants, with higher rates in infants of younger gestational age (Ray, Lorch, 2013). These hospital readmissions contribute to the higher healthcare costs and utilization seen in infants born prematurely (Underwood, et al., 2007; Wade, et al., 2008).

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Section 14: Identifying Information for the Measure Submitter

First Name: Scott

Last Name: Lorch

Title: Associate Professor of Pediatrics, Perelman School of Medicine, University of Pennsylvania; Harriet and Ronald Lassin Endowed Chair in

	Pediatric Neonatology and Director, Neonatal-Perinatal Medicine Fellowship, Division of Neonatology; Director Center for Perinatal and Pediatric Health Disparities Research, The Children's Hospital of Philadelphia
Organization:	The Children's Hospital of Philadelphia
Mailing Address:	3535 Market Street, Suite 1029
City:	Philadelphia
State:	PA
Postal Code:	19104
Telephone:	215-590-1714
Email:	lorch@email.chop.edu

The CHIPRA Pediatric Quality Measures Program (PQMP) Candidate Measure Submission Form (CPCF) was approved by the Office of Management and Budget (OMB) in accordance with the Paperwork Reduction Act.

The OMB Control Number is 0935-0205 and the Expiration Date is December 31, 2015.

Public Disclosure Requirements

Each submission must include a written statement agreeing that, should U.S. Department of Health and Human Services accept the measure for the 2014 and/or 2015 Improved Core Measure Sets, full measure specifications for the accepted measure will be subject to public disclosure (e.g., on the Agency for Healthcare Research and Quality [AHRQ] and/or Centers for Medicare & Medicaid Services [CMS] websites), except that potential measure users will not be permitted to use the measure for commercial use. In addition, AHRQ expects that measures and full measure specifications will be made reasonably available to all interested parties. "Full measure specifications" is defined as all information that any potential measure implementer will need to use and analyze the measure, including use and analysis within an electronic health record or other health information technology. As used herein, "commercial use" refers to any sale, license or distribution of a measure for commercial gain, or incorporation of a measure into any product or service that is sold, licensed or distributed for commercial gain, even if there is no actual charge for inclusion of the measure. This statement must be signed by an individual authorized to act for any holder of copyright on each submitted measure or instrument. The authority of the signatory to provide such authorization should be described in the letter.

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