

Initial Risk Assessment for Immobility-Related Pressure Ulcer Within 24 Hours of Pediatric Intensive Care Unit (PICU) Admission

Section 1. Basic Measure Information

1.A. Measure Name

Initial Risk Assessment for Immobility-Related Pressure Ulcer Within 24 Hours of Pediatric Intensive Care Unit (PICU) Admission

1.B. Measure Number

0203

1.C. Measure Description

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

The measure will be a chart review performed to determine the proportion of patients for whom an initial risk assessment for development of an immobility-related pressure ulcer is performed. The assessment is to be performed within the first 24 hours of admission to the pediatric intensive care unit (PICU) with the use of a standardized pressure ulcer risk assessment tool designated as appropriate by the institution. The results of the assessment must be documented in the patient's chart upon completion.

1.D. Measure Owner

Pediatric Measurement Center of Excellence (PMCoE)

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

Not applicable.

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.**

Not applicable.

- 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.**

Pediatric Intensive Care Unit (PICU) Measure Set.

- 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 PICU patients for whom an assessment of immobility-related pressure ulcer risk using a standardized pressure ulcer risk assessment tool was documented within 24 hours of admission.

Definitions: Standardized pressure ulcer assessment tool:

Assessment tool should be applied in a standardized basis to each patient admitted to the PICU and should be based on an immobility-related pressure ulcer risk assessment tool that has been validated for the majority of the institutions' PICU patients.

Currently, the Braden Q is the only validated immobility-related pressure ulcer risk assessment tool available for critically ill and injured children. Other validated risk assessment tools are acceptable, if available.

1.H. Numerator Exclusions

None.

1.I. Denominator Statement

All patients admitted to the PICU for at least 24 hours during a monthly or quarterly reporting period.

1.J. Denominator Exclusions

None.

1.K. Data Sources

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

Paper medical record; electronic health record (EHR).

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.

For Construction Using Manual Chart Abstraction

To construct this measure using manual chart abstraction, a research nurse or other trained medical professional will perform chart reviews and manually abstract each of the elements of the measure. For example, in addition to basic demographic elements, for this measure, elements such as PICU admission date (mm/dd/yyyy), PICU admission time (hh:mm, military time), PICU discharge or transfer date (mm/dd/yyyy), and PICU discharge or transfer time (hh:mm, military time) will be abstracted and used to identify the denominator population. Similarly, evidence of a standardized pressure ulcer risk assessment tool (yes/no), the date the standardized pressure ulcer risk assessment tool was administered (mm/dd/yyyy), and the time the standardized pressure ulcer risk assessment tool was administered (hh:mm, military time) will be abstracted from patient charts and used to identify which patients meet the numerator criteria.

Please see Supporting Documents for technical specifications and chart abstraction tool for this measure.

For Construction as an eMeasure in the Electronic Health Record

To construct this measure as an eMeasure in the Electronic Health Record (EHR), each of the measure elements must exist in structured, queryable fields; the eMeasure will be implemented in the EHR using the eMeasure specifications and an electronic algorithm that will compute the measure automatically and generate a performance report that indicates whether patients met the measure. Please see Supporting Documents, Section 2.A, for eMeasure specifications.

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).**

Definition

International Definition, National Pressure Ulcer Advisory Panel (NPUAP)/European Pressure Ulcer Advisory Panel (EPUAP) — “A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear.” The importance of preventing and reducing pressure ulcers has previously been well established as a nursing research priority and quality of care indicator. It is also understood that in the critical care environment, where it is common for patients to be immobile and/or reliant on technical devices, pressure ulcers are a serious iatrogenic injury. While a much greater focus has been placed on the incidence and risk to adult patients, critically ill infants and children are also at risk for development of pressure ulcers.

Potential for Quality Improvement

Identification of patients at risk is a key step in preventing development of pressure ulcers in critically ill and injured children. Targeted implementation of prevention strategies cannot happen if at-risk patients have not been identified. Early assessment of risk has been shown to be important in the prevention of immobility-related pressure ulcer development (Brandeis, Berlowita, Katz, 2001; Butler, 2006; Quigley, Curley, 1996; Sims, McDonald, 2003). The Braden Q is the only validated immobility-related pressure ulcer risk assessment tool available for use with critically ill children (Curley, Razmus, Roberts, 2003).

Prevalence and Severity of Condition

Using data from 19 States from 2006 to 2008, with over 5 million pediatric hospitalizations, HealthGrades reported that pediatric patients who experienced pressure ulcers had 6.15 percent mortality and a total excess cost of \$1.3 billion (Reed, May, 2010). In a study using data from the Healthcare Cost and Utilization Project (HCUP) from 2000 to 2007, Friedman et al. reported a 34.5 percent increase in pressure ulcer rates from 2000 to 2007 (Friedman, Berdahl, Simpson, 2011).

Similar results were reported from an earlier study by Sedman and colleagues, using the National Association of Children's Hospitals and Related Institutions aggregate Case Mix Comparative Database for 1999-2002, with 1.92 million discharges from 31 States (50 hospitals in 1999, increasing to 67 in 2002). In this study, pressure ulcer rates increased each year from 4.14 per 1,000 discharges in 1999 to 4.33 per 1,000 discharges in 2002 (Sedman, Harris, Schulz, 2005).

Fiscal Burden

Pressure ulcers have significant financial implications. In a case control study using nearest neighbor propensity score matching, the Agency for Healthcare Research and Quality (AHRQ) pediatric-specific Patient Safety Indicators (PSI) were used to identify adverse events in 431,524 discharges from 38 freestanding, academic, not-for-profit pediatric hospitals affiliated with the Child Health Corporation of America and participating in the Pediatric Health Information System database in 2006. They reported a pressure ulcer rate of 4.52 per 1,000 discharges, which is similar to the AHRQ reported rate of 4.33 per 1,000 discharges for the same year. Records with a pressure ulcer event had mean excess length of stay of 8.07 days and mean excess hospital charges of \$59,225, relative to matched controls. The excess charges came from all hospital cost centers, including pharmacy (\$10,959), supplies (\$4,663), laboratory (\$7,276), imaging (\$1,284), and other clinical activities (\$11,345) (Kronman, Hall, Slonim, 2008).

The Society of Actuaries' Health Section estimated the cost of Stage I or II pressure ulcer management to be \$8,730 on average (Society of Actuaries, 2010), while an adult study by Reddy et al. has estimated the cost of managing a single full-thickness (Stage III, Stage IV, and Unstageable) pressure ulcer to be as high as \$70,000 (Reddy, Gill, Rochon, 2006).

In addition to the fiscal burden, pressure ulcers potentially lead to infection, pain management challenges, disfigurement, increased length of stay, and readmission, as well as altered body image and psychological distress (Baharestani, Ratliff, 2007; Galvin, Curley, 2012).

Applicable to Changes Across Developmental Stages

Children of all ages are at risk for pressure ulcer during a critical illness (Baharestani, Ratliff, 2007). The necessity of screening for pressure ulcer risk applies to all developmental stages and age groups, so that outcomes may be improved by targeting appropriate prevention strategies (Baharestani, Ratliff, 2007).

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).**

In addition to the evidence of general importance described above, this measure is relevant and important to Medicaid and/or CHIP because the medically complex patients who are treated in the PICU often fall disproportionately into the Medicaid population. Children from poorer families are more likely to become critically ill, either because their access to care is not optimal or they have chronic conditions and do not receive the ongoing care needed to prevent a PICU admission.

The PICU is the “canary in the coal mine” for pediatric inpatient care; it is the intended placement location for the sickest children in the institution, where risk is high, teamwork is required, and resource utilization is elevated. The PICU is where lapses or gaps in safety or quality potentially are the most devastating, but it can also be the location where early improvement might be most noticeable if the correct measurements are assessed, analyzed, and acted upon.

Existing pediatric critical care quality measures are limited and simply do not capture the clinical relevance needed for measuring, reporting, and improving quality. Continued progress in measurement science has been shown to be effective in engaging clinicians and promoting the dissemination of best practices across many stakeholders to close quality gaps and produce true improvement in PICU care. Among the benefits to Medicaid/CHIP are cost savings through improved patient outcomes, more efficient staffing, more effective use of resources, and more efficient procedures.

The aim of this measure is to reduce the incidence of Stage II, Stage III, Stage IV, and Unstageable immobility-related pressure ulcers and deep tissue injury in critically ill and injured children, of which many are in the Medicaid population.

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).

No PICU-related measures are currently included in the Core Set of Children’s Health Care Quality Measures for Medicaid and CHIP (Child Core Set), yet the PICU is where a hospital’s sickest and most vulnerable children are treated. In addition to closing gaps in safety and/or quality, implementation of appropriate measurements in the PICU could mitigate much of the elevated risk and costs associated with pediatric critical care.

Early in its process, the PMCoE PICU Expert Workgroup conducted an extensive review of existing measures related to pediatric critical care. One that was found to be somewhat comparable in adult medicine, albeit in a different care setting (home health), is the National Quality Forum (NQF) measure #0538, Pressure Ulcer Prevention and Care. Stewarded by the Centers for Medicare & Medicaid Services, this measure’s description includes: “Pressure Ulcer Risk Assessment Conducted: Percentage of home health episodes of care in which the patient was assessed for risk of developing pressure ulcers at start/resumption of care.” Following this general model, the pediatric measure we are proposing for PICUs would be designed for critically ill and injured children in the PICU, a population that is at very high risk of pressure ulcer development. Furthermore, our measure would provide an enhancement in the field because it is focused on preventing immobility-related pressure ulcers. In the critical care environment, “immobility” – defined as limited or absolute lack of movement by the patient (Noonan, Quigley, Curley, 2011) - is a key concern in terms of preventing pressure ulcers, but it is important to distinguish from pressure ulcers that are “device-related.” Both types can occur in the PICU, but prevention strategies for each type of pressure ulcer can differ. Another related existing measure is NQF measure #0337, Pressure Ulcer Rate (PDI2).

This measure captures the rate of pressure ulcers (Stage III or IV) per 1,000 discharges among patients ages 17 years and younger (excluding neonates; stays less than 5 days; transfers from another facility; obstetric discharges; cases with diseases of the skin, subcutaneous tissue, and breast; discharges in which debridement or pedicle graft is the only operating room procedure; discharges with debridement or pedicle graft before or on the same day as the major operating room procedure; and those discharges in which pressure ulcer is the principal diagnosis or secondary diagnosis of Stage III or IV pressure ulcer is present on admission). One gap that our experts identified with this measure is that it is defined in such a way that patients who develop more than one pressure ulcer during their hospital stay will only be counted once in the numerator. Thus, this existing measure does not capture the true magnitude of the problem in this high-risk patient population. Another gap is that this existing measure is not PICU-specific; it is based on discharges from the entire hospital.

The measure we are proposing for PICUs would complement NQF measure #0337 and focus specifically on the high-risk PICU patient population. We anticipate it will reduce the incidence of pressure ulcers in the PICU by assessing risk in a timely manner.

We are further aware of an existing gap that still needs to be addressed. As we propose this process measure to implement a change in the culture for our PICU, no measure presently exists for conducting ongoing risk assessment and then implementing prevention strategies for at-risk PICU patients. (This is similar to the general premise for NQF measure #0538 in the home health care setting.) To address this gap, the following measures might be considered in the future.

- **Ongoing Risk Assessment for Immobility-related Pressure Ulcer in PICU Patients**

Proportion of patients admitted to the PICU for whom a risk assessment for immobility-related pressure ulcer was documented at daily intervals throughout the entire PICU admission.

- **Implementation of Prevention Strategies for Immobility-related Pressure Ulcer in PICU Patients**

Proportion of patients determined to be at greater than minimal risk for developing immobility-related pressure ulcer who received preventive treatment while admitted to the PICU.

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?

- Care Setting – ambulatory:** No.
- Care Setting – inpatient:** Yes.
- Care Setting – other – please specify:** No.
- Service – preventive health, including services to promote healthy birth:** Yes.
- Service – care for acute conditions:** Yes.
- Service – care for children with acute conditions:** Yes.
- Service – other (please specify):** No.
- Measure Topic – duration of enrollment:** No.
- Measure Topic – clinical quality:** Yes.
- Measure Topic – patient safety:** Yes.
- Measure Topic – family experience with care:** No.
- Measure Topic – care in the most integrated setting:** No.

- 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; infants 29-364 days.
- q. **Population – pre-school age children (1 year through 5 years) (specify age range):**
Yes; 1-5 years.
- r. **Population – school-aged children (6 years through 10 years) (specify age range):**
Yes; 6-10 years.
- s. **Population – adolescents (11 years through 20 years) (specify age range):** Yes; 11-20 years.
- 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.

Pressure ulcers are known to pose significant health problems in the PICU, yet the scope of this problem has not been widely studied in critically ill and injured children (Schindler, Mikhailov, Fischer, 2006). With the incidence of pressure ulcers in critically ill infants and children at 18 percent to 27 percent (Schindler, Mikhailov, Kuhn, 2011), it is vital that providers possess knowledge of the various risk factors (Bolton, 2007). Paramount to reducing the incidence of pressure ulcers is the provider's use of an appropriate means for predicting and screening pressure ulcers while also supporting the focus on prevention (Bolton, 2007).

In a retrospective study published in 2006 by Schindler, et. al., the incidence of pressure ulcers in the pediatric intensive care unit was examined, along with the associated risk factors for developing a pressure ulcer. The study sought to determine the incidence of skin breakdown in critically ill and injured children and to compare the characteristics of patients who experience

skin breakdown with patients who do not. Admission and follow-up data for a 15-week period were collected retrospectively on children admitted to a large PICU. The incidence of skin breakdown was calculated. The risk for skin breakdown associated with potential risk factors (relative risk) and 95 percent confidence intervals were determined. The sample consisted of 401 distinct stays in the intensive care unit for 373 patients. During the 401 stays, skin breakdown occurred in 34 (8.5 percent), redness in 25 (6.2 percent), and breakdown and redness in 13 (3.2 percent); the overall incidence was 18 percent. Patients who had skin breakdown or redness were younger, had longer stays, and were more likely to have respiratory illnesses and require mechanical ventilatory support than those who did not. Patients who had skin breakdown or redness had a higher risk of mortality than those who did not (Schindler, et al., 2006).

In a subsequent study by Schindler and colleagues, the key risk factors in children who develop pressure ulcers in the PICU were evaluated. The study sought to determine the incidence of pressure ulcers in critically ill children, compare the characteristics of patients in whom pressure ulcers do and do not develop, and identify prevention strategies associated with less frequent development of pressure ulcers. Characteristics of 5,346 patients in pediatric intensive care units in whom pressure ulcers did and did not develop were compared (Schindler, et al., 2011). Multiple logistic regression was used to determine which prevention strategies were associated with less frequent development of pressure ulcers. The authors found that the overall incidence of pressure ulcers was 10.2 percent. Patients at greatest risk were those who were more than 2 years old, were in the intensive care unit 4 days or longer, or required mechanical ventilation, noninvasive ventilation, or extracorporeal membrane oxygenation. Strategies associated with less frequent development of pressure ulcers included use of specialty beds, egg crates, foam overlays, gel pads, dry-weave diapers, urinary catheters, disposable under-pads, body lotion, nutrition consultations, change in body position every 2 to 4 hours, blanket rolls, foam wedges, pillows, and draw sheets (Schindler, et al., 2011).

In a multisite prospective cohort study, Curley and colleagues examined the incidence, location, and factors associated with the development of pressure ulcers in PICU patients. This study also described the different types of injuries that critically ill children, including infants, experience and the location of the skin breakdown. The occipital area was noted as being the most prevalent area for skin breakdown in children. Sites included three PICUs contained within freestanding children's hospitals; a total of 322 patients, ages 21 days to 8 years, on bed rest in the PICU for at least 24 hours without preexisting pressure ulcers or congenital heart disease. Patients were observed up to three times per week for 2 weeks, then once per week until PICU discharge, for a median of two observation periods (interquartile range, 1-4), reflecting 877 skin assessments. The study concluded that PICU patients at risk include those supported on mechanical ventilation, those with hypotension, and those who have low Braden Q scores (Curley, Quigley, Lin, 2003).

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.

The prevention of pressure ulcers can be separated into two primary steps: identifying patients at risk and implementing prevention strategies for those patients at risk (Brandeis, et al., 2001). While there is a consensus that some pressure ulcers remain unavoidable, such as in instances of hemodynamic instability, and other intrinsic factors (Edsberg, Langemo, Baharestani, et al., 2014), risk assessment and identification continue to be the most important factors in prevention. Baharestani, et al., stated in the National Pressure Ulcer Advisory Panel (NPUAP) White Paper that all pediatric patients should have a comprehensive skin and pressure ulcer risk assessment performed at the time of admission (Baharestani, et al., 2007). Sims and McDonald (2003) also agree that early identification of risk factors is ultimately the greatest tool to prevent their development.

Critically ill pediatric patients remain most at risk for pressure ulcer development due to their potential limitations in mobility, nutritional deficiencies, alteration in tissue perfusion or oxygenation (Gray, 2004), in addition to physiologic instability negating the capability to reposition themselves (McCord, McElvain, Sachdeva, 2004). Critically ill patients are often admitted with chronic diseases, as well as acute or traumatic conditions. They may have preexisting wounds or altered skin integrity due to a variety of factors related to their illness or treatment (Boynton, Paustian, 1996). Curley, et al., found that these patients may develop pressure ulcers as early as the first day of admission (Curley, et al., 2003).

In order to adequately address pressure ulcer risk assessment in the critically ill pediatric population, Quigley and Curley (1996) developed and validated the Braden Q assessment tool. In 2013, Schindler, et al, implemented a comprehensive pressure ulcer care bundle for critically ill infants. As part of the bundle, the team utilized the Braden Q risk assessment tool focusing on risk assessment on admission as well as a daily risk assessment. The implementation of the pressure ulcer care bundle was associated with a significant drop in the incidence of pressure ulcers from 18.8 percent to 6.8 percent (Schindler, et al., 2006)).

Through expert consensus, the Guideline for Prevention and Management of Pressure Ulcers developed by the Wound, Ostomy, and Continence Nurses Society (2010) provides the following recommendations:

- Perform risk assessment upon entry to a health care setting and repeat on a regularly scheduled basis or when there is a significant change in the individual's condition.
- Assess and inspect skin regularly.
- Use a valid and reliable risk assessment tool (recommended).

It is worth noting that the guideline states that an admission assessment should include both a risk assessment (to evaluate risk of developing a pressure ulcer) and a skin assessment (to detect existing pressure ulcers). These two assessments should be thought of as a single process step: a pressure ulcer admission assessment. The prompt identification of at-risk patients using a validated risk assessment tool is essential for accurate and timely implementation of prevention strategies. The risk assessment must include an assessment of several components: mobility incontinence, sensory deficiency, and nutritional assessment (Wound, Ostomy, and Continence Nurses Society [WOCN], 2010).

A prospective study by Visscher and colleagues sought to develop and implement a quality improvement (QI) intervention to reduce pressure ulcers by 50 percent in both the neonatal intensive care unit (NICU) and the PICU at Cincinnati Children's Hospital Medical Center. A QI collaborative leadership team was established, pressure ulcer rates were measured during an initial period of rapid-cycle tests of change, a QI bundle was developed, and the pressure ulcer rates were evaluated after the QI implementation. The study encompassed 1,425 patients over 54,351 patient days in the PICU and NICU. The pressure ulcer rate in the PICU was 14.3/1,000 patient days during the QI development and 3.7/1,000 patient days after QI implementation ($P < .05$), achieving the aim of 50 percent reduction. The PICU rates of stages I, II, and III immobility-related and device-related pressure ulcers decreased after the QI intervention. The pressure ulcer rate in the NICU did not change significantly over time but remained at a mean of 0.9/1,000 patient days. In the post-implementation period, 3 points were outside the control limits, primarily due to an increase in pressure ulcers associated with pulse oximeters and cannulas. Based on these results, the authors concluded that the collaborative QI model was effective at reducing pressure ulcers in the PICU. Heightened awareness and early intervention are necessary to further reduce pressure ulcer rates (Visscher, King, Nie, et al., 2013).

Pediatric patients are at risk for developing pressure ulcers and associated pain, infection risk, and prolonged hospitalization (Visscher, et al., 2013). Stage III and IV ulcers are serious, reportable events. Substantial evidence has been presented in this report to demonstrate that conducting a risk assessment for pressure ulcers upon a patient's admission to the PICU, using a valid and reliable assessment tool, is vital to the implementation of appropriate prevention strategies that will ultimately improve outcomes.

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.

Construction of the eMeasure and Manual Chart Abstraction of the Measures

Testing Sites

The testing sites for the testing of this measure included three hospitals of the Chicago Pediatric Quality and Safety Consortium (CPQSC): Lutheran General Children's Hospital, Christ Hope

Children's Hospital, and Anne and Robert H. Lurie Children's Hospital. A description of the CPQSC participating hospitals is presented in the Supporting Documents.

Methods

As feasibility testing indicated that this measure was feasible in the three CPQSC sites, these sites performed parallel forms reliability testing where the eMeasure was constructed as a report in the EHR, and a subset of the patients' eMeasure results were compared against the results of manual chart reviews for the same subset of patients. The patient sample was identified at each site using a reporting period of 01 January – 31 March 2015 for Lurie Children's Hospital and 01 January – 31 December 2015 for the two Advocate hospitals.

At Lurie Children's Hospital, this measure was then implemented in the sites' EHR using an electronic algorithm, which computed the measure automatically and generated a performance report on the selected sample of patients. At the same time, a trained chart abstracter performed manual chart reviews on the same patients. Manual chart abstraction was then compared to the automated data abstraction to determine how reliably the overall measure and individual measure elements were calculated.

Lutheran General Children's Hospital and Christ Hope Children's Hospital conducted a reliability assessment across two time periods of performance measurement using this measure as a chart review measure, for the time periods 01 January – 30 June 2015 and 01 July – 31 December 2015. Using an electronic algorithm, charts were identified that met the denominator criteria, were stratified by age group (0 - < 6 years, 6 - < 12 years, 12 - < 18 years), and were randomly selected for abstraction within each age strata.

To complete the manual chart abstraction, whether conducting parallel forms testing to assess the reliability of the eMeasure or reliability across time for the chart review measure, the following algorithm was followed:

1. Evaluate the charts in the patient sample to see whether the patients meet the denominator criteria: admitted to the PICU for at least 24 hours during the reporting period.
2. Collect demographics and elements for equity assessment: age, gender, race/ethnicity, language preference, insurance status/type.
3. Review patient chart and document measure elements in the chart abstraction tool, including both denominator and numerator measure elements.
4. Note relevant comments.

Analysis

At Lurie Children's, data analysis included construction of the eMeasure performance report for the entire sample to assess clinical performance, construction of the eMeasure for a sub-sample of the selected patients, and assessment of agreement across chart abstractions and electronic eMeasure output for the same patients. At Lutheran General Children's Hospital and Christ Hope Children's Hospital, data analysis included assessment of clinical performance for this chart review measure and assessment of reliability of the reported clinical performance of the measure

across time. The intent of the analysis was to test the ability to construct this measure as both an eMeasure and a measure for manual chart review and to test the reliability and validity of the measure construction via each method. The results were analyzed to assess the level of agreement between the chart abstraction and the electronic eMeasure output and for the overall reported performance. The results of reliability and validity testing provide a basis for the use of this measure as a measure of performance for public reporting and quality improvement.

Results

Lurie Children's Hospital was able to assess this eMeasure electronically, providing electronic output for 106 unique patients representing 109 events. Lurie Children's Hospital also performed five chart reviews. Lutheran General Children's Hospital and Christ Hope Children's Hospital assessed this measure as a chart review measure, providing complete chart reviews (i.e., the patient met the denominator criteria) for 325 patients. Please see Section 7 for information regarding the race/ethnicity, socioeconomic status, and language preferences of these patient samples.

eMeasure Performance Results

Overall (N=106), for this eMeasure, clinical performance was fairly high, with 94 percent of patients meeting the measure. Reasons for not meeting the measure included having a pressure ulcer assessment performed outside of the 24-hour window (N=4) and not having a pressure ulcer assessment performed at all (N=3). Looking across age brackets, of the children aged 0 - <6 (N=66), 92 percent met the measure, of the children aged 6 - <13 (N=16), 94 percent met the measure, of the children aged 13 - <19 (N=20), 95 percent met the measure, and of PICU patients 19 and older (N=4), 100 percent met the measure.

Chart Review Performance Results

Across all three sites (N=330), the clinical performance for this chart review measure was high, with 98 percent of patients meeting the measure. Reasons for not meeting the measure included not having a pressure ulcer risk assessment documented in the chart (N=5) or having a pressure ulcer risk assessment performed over 24 hours after PICU admission (N=1). Eleven patients who had pressure ulcer risk assessments performed within 24 hours of PICU admission were not included in the analysis because they did not stay in the PICU for at least 24 hours and therefore did not meet the denominator criteria. The clinical performance of this measure was high across all sites, with 98 percent of patients at Lutheran General Children's Hospital, 98 percent of patients at Christ Hope Children's Hospital, and 100 percent of patients at Lurie Children's meeting the measure and across all age brackets with 97 percent of children aged 0-<6 (N=127), 99 percent of children aged 6-<13 (N=105), and 99 percent of children aged 13-<18 (N=93) meeting the measure.

Reliability Testing

At Lurie Children's Hospital, chart abstractions were performed for five patient charts for patient-level data included in the electronic output. Agreement for parallel-forms reliability testing was 100 percent for measure elements: admission date, race, ethnicity, payer, and whether a pressure ulcer risk assessment was performed within 24 hours of admission. Similarly,

agreement was 100 percent for overall clinical performance of the measure. As agreement was 100 percent with no variability, a kappa statistic cannot be computed.

At Lutheran General Children’s Hospital and Christ Hope Children’s Hospital, the clinical performance was comparable across two time periods of performance measurement (N1=216, N2=109), with 99 percent of patients who received a pressure ulcer risk assessment between 01 January – 30 June 2015 meeting the measure, as compared to 97 percent of patients who received the assessment between 01 July – 31 December 2015. This was not statistically significant (p=0.41).

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).

The PMCoE used the American Medical Association’s Physician Consortium for Performance Improvement (AMA-PCPI) Wheel Methodology, extensively used in the adult setting, to develop clinically relevant quality measures for pediatric critical care, including this measure aimed at reducing the incidence of Stage II, Stage III, Stage IV, and Unstageable immobility-related pressure ulcers and deep tissue injury in critically ill and injured children (Physician Consortium for Performance Improvement [PCPI], 2017).

This measure was assessed for content validity by looking for agreement among subject matter experts, specifically by the panel of stakeholder representatives serving as members of the Pediatric Intensive Care Unit (PICU) Expert Workgroup during the development process (Attachment 6.B.1). This multidisciplinary, national panel consisted of physicians, nurses, parent/family representatives, and measure methodologists.

Additionally, input on the content validity of draft measures was obtained through a 21-day public comment period. The Expert Workgroup reviewed all comments received and modified the measures as needed (see Supporting Documents, Section 6-B). Finally, the Expert Workgroup considered the following questions during the content validity assessment of this measure:

- 1. How strong is the scientific evidence supporting the validity of this measure as a quality measure?**
100 percent of respondents indicated “Very Strong (55 percent)” or “Somewhat Strong (45 percent).”
- 2. Are all individuals in the denominator equally eligible for inclusion in the numerator?**
100 percent of respondents answered “Yes.”
- 3. Is the measure a result under control of those whom the measure evaluates?**

100 percent of respondents answered “Yes.” Comment: Mostly. Pressure ulcers can occur in the operating room (OR) or emergency department (ED), but these are the exception, not the rule.

4. How well do the measure specifications capture the event that is the subject of the measure?

100 percent of respondents indicated “Very Well” or “Somewhat Well” – Very Well, 73 percent, Somewhat Well (27 percent).

5. Does the measure provide for fair comparisons of the performance of providers, facilities, health plans, or geographic areas?

100 percent of respondents answered “Yes.”

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

The PMCoE PICU Expert Workgroup and Measure Champions were focused from the outset on the incorporation of specified elements to assess equity/disparities, particularly race/ethnicity, payer status (socioeconomic status inferred), and language preference. Additionally, performance of this measure was assessed by gender. Attention to equity/disparities assessment was incorporated into each stage of the measure development and testing process.

Although in our research into the incidence and risk factors for pressure ulcer we did not find evidence that suggested disparities by race in a pediatric population, a study by Fogerty, et al., did conclude that adult African Americans show increased risk for pressure ulcers compared with Caucasians. They was also noted that the pressure ulcer diagnoses tended to occur at younger ages in African Americans (Fogerty, Guy, Barbul, et al., 2009).

We recognize the value of testing in a diverse population so that the measure might be capable of producing stratified results to identify any disparities in the measure’s performance. In specifying this measure, the Supplemental Data Elements included:

- Patient Characteristic Race using the Race CDCREC Value Set (CDC, 2000).
- Patient Characteristic Ethnicity using the Ethnicity CDCREC Value Set (CDC, 2000).

This measure was tested in three of the CPQSC Sites.

At Lurie Children’s (N=106), approximately 37 percent (N=39) of the sample was white, 34 percent (N=36) was Hispanic, 16 percent (N=17) was black, 12 percent (N=13) was other, and less than 1 percent (N=1) was unknown. The clinical performance was similar across race/ethnicity groups, with 97.5 percent of white patients, 82 percent of black patients, and 94 percent of Hispanic patients meeting the measure. Similarly, of patients who listed their race/ethnicity as “other” or “unknown,” 92 percent and 100 percent met the measure, respectively. These differences were not statistically significant.

At Lutheran General Children’s Hospital and Christ Hope Children’s Hospital (N=325), approximately 43 percent (N=138) of the sample was white, 25 percent (N=81) was black, 21 percent (N=69) was Hispanic, 6 percent (N=21) was other, and 5 percent (N=16) was unknown. This clinical performance of the chart review measure was high across all groups, with 97 percent of white patients, 99 percent of black patients, 99 percent of Hispanic patients, and 100 percent of patients who listed their race/ethnicity as “other” or “unknown” meeting the measure. These differences were not statistically significant.

7.B. Special Health Care Needs

The performance of this measure for children with special health care needs was not assessed.

7.C. Socioeconomic Status

A study by Smith, et al., examined decubitus ulcer (pressure ulcers) as one of two markers for discrepancies in care (the other being ulceration), using all pediatric hospital discharges for patients age 0–17 in Florida, New York, and Wisconsin and at risk for either of the two patient safety events identified, for the years 1999–2001 (N=859,922). For our purposes, we considered the study’s focus on the relationship of Medicaid patient, hospital, and market characteristics to the occurrence of pressure ulcer in hospitalized children. It was found that at the market level, a pediatric patient was more likely to experience a patient safety event (i.e., pressure ulcer) when the market favored Medicaid payers, that is, markets in which Medicaid has relatively few competitors (Smith, Cheung, Owens, et al., 2007).

We recognize the value of testing in a diverse population so that the measure might be capable of producing stratified results to identify any disparities in the measure’s performance. In specifying this measure, the Supplemental Data Elements included:

- Patient Characteristic Payer using the Payer SOP Value Set (Public Health Data Standards Consortium, Updated 2016).

At Lurie Children’s, 61 percent (N=65) of patients in the sample had private insurance, while the remaining 42 percent (N=41) used Medicaid. The clinical performance of the eMeasure was comparable in both groups, with 95 percent of patients with private insurance and 90 percent of Medicaid patients meeting the measure criteria for having an immobility-related pressure ulcer risk assessment performed using a standardized pressure ulcer risk assessment tool within 24 hours of admission. This difference was not statistically significant.

Across Lutheran General Children’s Hospital and Christ Hope Children’s Hospital, 60 percent (N=195) of the patients in the sample had private insurance, while the remaining 40 percent (N=130) used Medicaid. Clinical performance was comparable in both groups, with 98 percent of patients with private insurance and 98 percent of Medicaid patients meeting the measure criteria. This difference was not statistically significant.

7.D. Rurality/Urbanicity

All testing sites are located in the Chicagoland area; therefore, this measure was not assessed for rurality/urbanicity.

7.E. Limited English Proficiency (LEP) Populations

We recognize the value of testing in a diverse population so that the measure might be capable of producing stratified results to identify any disparities in the measure’s performance. In specifying this measure, we assessed for language preference.

At Lurie Children’s, 83 percent (N=88) of patients reported that their language preference was English, 15 percent (N=16) reported Spanish, and 2 percent (N=2) reported other languages. The clinical performance of the eMeasure was similar across these groups, with 95 percent of English-speaking patients meeting the measure, 88 percent of Spanish speaking-patients meeting the measure, and 100 percent of patients who spoke other languages meeting the measure. This difference was not statistically significant.

Across Lutheran General Children’s Hospital and Christ Hope Children’s Hospital, 93 percent (N=302) of patients reported that their language preference was English, 5 percent (N=18) reported Spanish, 1 percent (N=3) reported other languages, and 1 percent (N=2) did not report a language preference. Clinical performance was slightly lower in the Spanish-speaking group, with 94 percent of patients meeting the measure as compared with 98 percent of English-speaking patients and 100 percent of patients who did not report a language or who primarily spoke other languages. This difference was not statistically significant.

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 feasibility of the construction of this measure was assessed as an eMeasure in the CPQSC, which includes Advocate Children’s Hospital – Park Ridge, Advocate Children’s Hospital – Oak Lawn, John H. Stroger Hospital, and Lurie Children’s Hospital. The EHR vendor systems used

across these institutions included Epic and Cerner. Please see Supporting Documents (Section 8.A) for the Data Element Table (DET) tool used in feasibility testing.

Based on the informaticists' assessments at each site and further validation of responses by the PhD level bioinformaticist at Northwestern University, this measure was determined to be "technically feasible, can do today" at all four testing sites, indicating that each of the EHR systems had structured fields for all measure criteria. This measure also had implementation feasibility at three testing sites, Advocate Children's Hospital – Park Ridge, Advocate Children's Hospital – Oak Lawn, and Lurie Children's Hospital. It was determined that John H. Stroger Jr Hospital of Cook County was "feasible with workflow modifications or changes to the EHR," which makes measure implementation at that site not possible. Please see the feasibility testing results in the Supporting Documents (Section 8.A).

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?

Of the four testing sites, this measure was considered "feasible with workflow modifications or changes to the EHR" in only one testing site, but it was feasible in the three other sites. It was determined that this measure was not yet feasible at John H. Stroger Jr Hospital of Cook County due to the fact that while there is a structured field indicating that the Braden-Q was administered, the tool itself was, as of the time of this study, administered on paper and not incorporated into the EHR. At this site, this often results in tests being administered without documentation of the event in the available structured field. Currently, the number of administered Braden-Q screens that are documented in a structured field in the medical record is unknown.

Recommendations to modify the current system to enhance the feasibility of this measure include developing an integrated tool that allows consistent capture of this data element and implementing it in hospitals that currently administer the Braden-Q on paper. This will greatly increase the chances of implementation feasibility at these institutions.

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.

Not applicable.

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?

Not applicable.

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

Not applicable.

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?

Not 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?

There are no unintended consequences for reporting this measure if the data are accurate.

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)

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?

Not 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?

There are no unintended consequences for reporting this measure if the data are accurate.

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)

Yes.

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

No.

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 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?

There are no unintended consequences for reporting this measure if the data are accurate.

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

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?**

Not 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?**

There are no unintended consequences for reporting this measure if the data are accurate.

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?**

No.

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 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?

Not applicable.

Provider Level

Hospital: Can compare hospitals

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?

Not 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?

There are no unintended consequences for reporting this measure if the data are accurate.

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)

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?

Not 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?

There are no unintended consequences for reporting this measure if the data are accurate.

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).

During late summer 2014, together with four other draft PICU measures, this measure was widely disseminated during a 21-day period of Public Comment. The objective was two-fold: (1) to provide stakeholders with an opportunity to review the draft measures and advise PMCoE on appropriate changes in content, based on their respective areas of expertise; and (2) to assess the public's perception of the draft measures' usefulness and understandability.

In the case of this measure, Initial Risk Assessment for Immobility-Related Pressure Ulcer within 24 Hours of PICU Admission, we were able to enhance the usefulness and understandability by making the following change directly indicated from Public Comment.

At the time the measure was sent out for Public Comment, the Denominator Statement was written as: "All patients admitted to the PICU with an admission ending during the reporting period." Commenters raised questions and expressed confusion about this. Did the statement mean when the PICU admission ended, or when the hospital admission ended? Feasibility concerns also were raised about how this would be reported in the case of very long stays and/or multiple stays. Measure Champions reviewed the comments, and subsequently revised the Denominator Statement to enhance clarity.

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.

Health IT could be helpful in increasing the ability of institutions to implement this eMeasure. While this measure was technically feasible in all four testing sites, one site was unable to implement this measure due to required workflow changes. Health IT could be helpful in

improving the ability of sites to implement this measure by developing an integrated tool that allows consistent capture of the administration of the Braden-Q in the EHR system.

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?

Feasibility testing for construction of this eMeasure was conducted in four sites in the CPQSC, and in three sites it was determined to be technically feasible to construct the measure. The feasibility of the measure was assessed using Cerner and Epic EHR systems. Of the three sites using Cerner, two could feasibly construct the measure. One site could technically construct the measure; however, clinical documentation workflow modifications would be necessary in order to reliably and validly implement the measure in the EHR. This measure was feasible in the site using EPIC. Further details are provided in Section 8.

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.

This eMeasure was technically feasible but not feasible for implementation at one site because while there was a structured field indicating that the Braden-Q was administered, the tool itself was, at the time of this study, administered on paper and not incorporated into the EHR. This often resulted in tests being administered without documentation of the event in the available structured field. Developing an integrated tool into the EMR that would allow consistent capture of the administration of the Braden-Q directly would greatly increase implementation feasibility at sites that are currently using paper-based Braden-Q assessments. Furthermore, if the score of the Braden-Q is also captured and if the score falls below normal range, a prompt function could be activated to flag the patient chart such that a health care provider can assist the patient.

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 criteria (see healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov_standards_ifr/1195)?

No.

If yes, please describe.

Not applicable.

11.E. Health IT Calculation

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

The majority of data elements were identifiable and encoded as structured data in the EHR systems of each of our test sites, and we are confident that these elements will exist as structured data in the majority of EHR systems. The biggest concern regarding the calculation of this measure is that one site did not consistently utilize the available structured field for administration of the Braden-Q. Other sites that administer paper-based forms and fail to consistently utilize the existing structured field, this element will not be captured or might be inconsistently captured producing unreliable results. We recommend that sites develop standard practice of consistently utilizing the structured fields present in their current EHR system to improve performance assessment.

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?

Not applicable.

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).

Additional Measures Needed

While we recognize that this proposed measure is a step in the right direction for pediatric critical care medicine, a limitation exists because no measure is currently in place for conducting ongoing risk assessment and then implementing prevention strategies for at-risk PICU patients. Earlier in our grant period, the Expert Workgroup had developed two additional complementary measures to address this gap, but due to resource limits, they were never specified or tested. It could be that the field would benefit greatly from pursuing the following complementary measures in the future:

Ongoing Risk Assessment for Immobility-Related Pressure Ulcer in PICU Patients:

Proportion of patients admitted to the PICU for whom a risk assessment for immobility-related pressure ulcer was documented at daily intervals throughout the entire PICU admission.

Implementation of Prevention Strategies for Immobility-Related Pressure Ulcer in PICU

Patients: Proportion of patients determined to be at greater than minimal risk for developing immobility-related pressure ulcer that received preventive treatment while admitted to the PICU.

eMeasure Limitations

The primary limitation of this measure as an eMeasure is that some hospitals may administer the Braden-Q screen on paper, which can lead to inconsistent documentation in structured fields for the elements of the measure meaning the results may not be integrated into the EHR. However, we found that this was a limitation in only one of our four testing sites, and that the measure was easily constructed in the other three sites' EHR systems during parallel forms reliability testing.

Chart Review Limitations

Chart review measures can be time consuming, and institutions may not have the resources to complete them. Adding to this, a limitation of this measure as a chart review measure is that the Braden Q, if administered on paper, may be a scanned document that may be difficult to find in the medical record. Additionally, most State Medicaid and CHIP programs find chart review as a method for quality assessment too challenging and burdensome, and therefore, they do not use measures specified for manual chart abstraction. An additional limitation is the small clinical performance gap we found from performance assessment for this measure.

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.

Rationale for Selection

Importance

Identification of patients at risk is a key step in preventing development of pressure ulcers in critically ill and injured children. Targeted implementation of prevention strategies cannot happen if at-risk patients have not been identified. Early assessment of risk has been shown to be important in the prevention of immobility-related pressure ulcer development (Brandeis, et al., 2001; Butler, 2006; Quigley, Curley, 1996; Sims, McDonald, 2003). The Braden Q is the only validated immobility-related pressure ulcer risk assessment tool available for use with critically ill children (Curley, et al., 2003).

Critically ill pediatric patients remain most at risk for pressure ulcer development due to their potential limitations in mobility, nutritional deficiencies, and alteration in tissue perfusion or oxygenation (Gray, 2004), in addition to physiologic instability negating the capability to reposition themselves (McCord, et al., 2004). Curley, et al., (2003) found that patients may develop pressure ulcers as early as the first day of admission to the PICU.

Pressure ulcers cause significant financial burden and human distress. The Society of Actuaries' Health Section estimated the cost of Stage I or II pressure ulcer management to be \$8,730 on average (Society of Actuaries, 2010), while an adult study by Reddy et al., (2006) has estimated

the cost of managing a single full thickness (Stage III, Stage IV, and Unstageable) pressure ulcer to be as high as \$70,000.

Additionally, pressure ulcers potentially lead to infection, pain management challenges, disfigurement, increased length of stay, and readmission, as well as altered body image and psychological distress (Galvin, Curley, 2012; Baharestani, Ratliff, 2007). Experts agree it is better to prevent pressure ulcers than to treat them after they have occurred.

Desirable Attributes and Limitations

The aim of this measure is to reduce the incidence of Stage II, Stage III, Stage IV, and Unstageable immobility-related pressure ulcers and deep tissue injury in critically ill and injured children. This measure is consistent with the Guideline for Prevention and Management of Pressure Ulcers developed by the Wound, Ostomy, and Continence Nurses Society (2010).

While we recognize that this proposed measure is a step in the right direction for pediatric critical care medicine, a limitation exists because no measure is currently in place for conducting ongoing risk assessment and then implementing prevention strategies for at-risk PICU patients. Earlier in our grant period, our Expert Workgroup had developed two additional complementary measures to address this gap, but due to resource limits, they were never specified or tested. It could be that the field would benefit greatly from pursuing the following complementary measures in the future:

Ongoing Risk Assessment for Immobility-Related Pressure Ulcer in PICU Patients

Proportion of patients admitted to the PICU for whom a risk assessment for immobility-related pressure ulcer was documented at daily intervals throughout the entire PICU admission.

Implementation of Prevention Strategies for Immobility-Related Pressure Ulcer in PICU Patients

Proportion of patients determined to be at greater than minimal risk for developing immobility-related pressure ulcer that received preventive treatment while admitted to the PICU.

Advantages

No PICU-related measures are currently included in the Core Set of Children's Health Care Quality Measures for Medicaid and CHIP (Child Core Set), yet the PICU is where a hospital's sickest and most vulnerable children are treated. Implementation of this measure could mitigate much of the elevated risk and costs associated with pediatric critical care by advancing the use of an already validated tool to reduce the incidence of immobility-related pressure ulcers in the PICU setting.

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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.

AHRQ Publication No. 16(17)-P002-4-EF
April 2017