Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Pressure ulcer: percentage of stage III or IV pressure ulcers per 1,000 discharges for patients ages 17 years and younger.

Source(s)

AHRQ QI research version 5.0. Pediatric quality indicator 2 technical specifications: pressure ulcer rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 5 p.

National Quality Forum measure information: pressure ulcer rate (PDI 2). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 16 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of stage III or IV pressure ulcers per 1,000 discharges for patients ages 17 years and younger.

This measure summary represents the overall rate and includes metrics for discharges grouped by risk category. See also the "Basis for Disaggregation" field.

Rationale

This indicator is intended to flag cases of pressure ulcer that arise during a hospital stay. Acutely ill and immobilized neonates and children are at risk for pressure ulcer (PU) development. PUs cause considerable harm to patients and may lead to increased hospital costs and length of stay. PUs may

predispose the patient to infection, sepsis, and treatment that may require surgical intervention. Occipital PUs may cause permanent alopecia, embarrassment, and body image disturbances (McCord et al., 2004). Over 82% of the PU events in adults are thought to preventable (Baharestani & Ratliff, 2011). Given the anatomical and physiological differences between adults and children, the number of preventable events in children and neonates may differ, as suggested by the relatively large number of events (49% of true positive events) in one study that were categorized by pediatric practitioners as not clearly preventable (Scanlon et al., 2008). However, stakeholder groups such as the Pediatric Affinity Group (n.d.) (American Academy of Pediatrics, Child Health Corporation of America, National Association of Children's Hospital and Related Institutions, and National Initiative for Children's Healthcare Quality) agree that the goal should be to eliminate PU in the pediatric population and that PU in pediatric patients should and can be prevented.

Evidence for Rationale

Baharestani MM, Ratliff CR. Pressure ulcers in neonates and children: an NPUAP white paper. Adv Skin Wound Care. 2007 Apr;20(4):208, 210, 212, 214, 216, 218-20. PubMed

McCord S, McElvain V, Sachdeva R, Schwartz P, Jefferson LS. Risk factors associated with pressure ulcers in the pediatric intensive care unit. J Wound Ostomy Continence Nurs. 2004 Jul-Aug;31(4):179-83.

National Quality Forum measure information: pressure ulcer rate (PDI 2). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 16 p.

Pediatric Affinity Group. How-to-guide: prevent pressure ulcers -- pediatric supplement. Cambridge (MA): Institute for Healthcare Improvement (IHI); 28 p.

Scanlon MC, Harris JM 2nd, Levy F, Sedman A. Evaluation of the agency for healthcare research and quality pediatric quality indicators. Pediatrics. 2008 Jun;121(6):e1723-31. PubMed

Primary Health Components

Pediatrics; pressure ulcer (PU)

Denominator Description

Surgical and medical discharges for patients ages 17 years and younger (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for pressure ulcer and any secondary ICD-9-CM diagnosis codes for pressure ulcer stage III or IV (or unstageable) (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Using data from 19 states from 2006 to 2008, with over five million pediatric hospitalizations, HealthGrades (Reed & May, 2010) reported that pediatric patients who experienced this event had 6.15% mortality and a total excess cost of $1.3 billion. In a study utilizing data from the Healthcare Cost and Utilization Project (HCUP) from 2000 to 2007, Friedman et al. (2011) reported a 34.5% increase in pressure ulcer (PU) rates from 2000 to 2007. It is unclear whether this increase is due to improved reporting or increasing prevalence during pediatric hospitalizations. The authors cautioned that "present on admission data" were not used and the sample of hospitals varied over the years.

However, similar results were reported from an earlier study by Sedman and colleagues (2005), using the National Association of Children's Hospitals and Related Institutions aggregate Case Mix Comparative Database for 1999 to 2002, with 1.92 million discharges from 31 states (50 hospitals in 1999, increasing to 67 in 2002). In this study, PU rates increased each year from 4.14 per 1000 discharges in 1999 to 4.33 per 1000 discharges in 2002. Pressure ulcers were noted frequently for children with poor perfusion (i.e., those undergoing extracorporeal membrane oxygenation or requiring adrenergic agents to support blood pressure, with resultant poor skin perfusion).

In a case control study using nearest-neighbor propensity score matching, the Agency for Healthcare Research and Quality (AHRQ) pediatric-specific Patient Safety Indicators (PSIs) 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 American and participating in the Pediatric Health Information System database in 2006. They reported a PU 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 PU 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).

Evidence for Additional Information Supporting Need for the Measure

Friedman B, Berdahl T, Simpson LA, McCormick MC, Owens PL, Andrews R, Romano PS. Annual report on health care for children and youth in the United States: focus on trends in hospital use and quality. Acad Pediatr. 2011 Jul-Aug;11(4):263-79.

National Quality Forum measure information: pressure ulcer rate (PDI 2). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 16 p.

Sedman A, Harris JM 2nd, Schulz K, Schwalenstocker E, Remus D, Scanlon M, Bahl V. Relevance of the Agency for Healthcare Research and Quality Patient Safety Indicators for children's hospitals. Pediatrics. 2005 Jan;115(1):135-45. [17 references] PubMed

The first annual HealthGrades Pediatric Patient Safety in American Hospitals Study. Golden (CO): HealthGrades; 2010 Aug. 25 p. [10 references]

Extent of Measure Testing

Reliability Testing

Data/Sample. Includes approximately 6 million pediatric discharges for 2,500 hospitals (Healthcare Cost and Utilization Project [HCUP] State Inpatient Databases [SID]," 2008).

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

Testing Results. What the data demonstrate is systematic variation in the provider level rate of 0.647 to 3.222 per 1,000 from the 5th to 95th percentile after a signal ratio of 0.324 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

California data from 2005 to 2007, which included "present on admission" (POA) reporting, were used to determine the percentage of hospitals with patient volumes sufficient to readily use the Quality Indicator (QI) for tracking performance over time. The unadjusted event rate was 3.1 per 1,000 when POA cases were not excluded and 1.4 per 1,000 when POA information was used, as in current AHRQ software. Only 4 of 353 California hospitals (1.1%), with 24% of the eligible discharges statewide, had sufficient patient volume to detect a hypothetical doubling of the Pediatric Quality Indicator (PDI) 01 rate. This problem could be minimized by focusing public reporting of this indicator on hospitals that meet a minimum pediatric volume threshold, or by incorporating it into a more robust composite measure (Bardach, Chien, & Dudley, 2010).

Validity Testing

Data/Sample. The most recent study of the criterion validity of PDI 02 was based on a consecutive sample of 254 flagged cases from 28 participating hospitals in the National Association of Children's Hospitals and Related Institutions (NACHRI) from 2003 through 2005 (Scanlon et al., 2008). Records were reviewed independently by clinicians at each site, who lacked formal training but were guided by teleconference discussions. A previous review of 118 flagged cases from 14 self-selected children's hospitals in the NACHRI Pediatric Patient Safety Indicators (PSI) Collaborative (Scanlon et al., 2006) used similar methods.

Analytic Method. Forty-four distinct professional clinical organizations and hospital associations were invited to submit nominations. These organizations were selected based on the applicability of the specialty or subspecialty to the candidate quality indicators. Refer to the original measure documentation for additional information on panel selection.

Four panels were formed to evaluate indicators grouped as follows: Medical and surgical indicators, surgical only indicators, neonatal indicators and prevention indicators. All panels had diversity in the geographic location of panelists, and their type of practice.

Criterion validity is analyzed by calculating positive predictive value (PPV), which is defined as the percentage of reported events that are confirmed as true events based upon application of a "criterion (gold) standard." In the cited studies, the criterion standard was based on review of randomly or chronologically sampled medical records by an experienced clinician, using a standard data collection tool and guidelines.

Testing Results. Face validity was systematically assessed using an expert panel process, as described in original submission documents (McDonald et al., 2006). Specifically, this indicator was reviewed by a pediatric specialty panel with ten pediatric clinicians, including one neonatologist, one infectious disease specialist, one ambulatory care pediatrician, one hospitalist, one cardiovascular surgeon, one oncologist, two surgeons, one interventional radiologist, and one critical care physician. Median ratings were 7 (on a scale of 1 to 9) with indeterminate agreement on usefulness for internal quality improvement, 7 with indeterminate agreement for comparative reporting, and 7 with indeterminate agreement for

preventability. Interestingly, the expert panel felt that the indicator was most useful when tracking high risk populations, including patients with hemiplegia, paraplegia, quadriplegia (e.g., due to cerebral palsy), spina bifida, muscular dystrophies, and neurologic impairment due to trauma. Panelists also noted that "skin breakdown" or "sores" in newborns rarely stem from gravity alone, but rather from friction from equipment and other processes. These sores may not be identified as decubiti, so they are likely to be coded differently. For this reason, newborns were excluded from the PDI 02 denominator.

Studies targeting the validity of administrative data to measure hospital-acquired pressure ulcers (HAPU) in the pediatric population are limited. The larger, more recent study published in 2008 estimated a PPV of 54%, which is substantially higher than the PPV estimates for the adult version of this indicator (e.g., 30% [95% confidence interval (CI), 22% to 40%] and 26% [95% CI, 22% to 30%] for PSI 03). Fewer details are reported from the earlier (2006) study, but Table 1 in that paper suggests a PPV of at least 54% to 64%. The great majority of false positives were due to ulcers that were actually present on admission (i.e., 93 of 116 false positives in the NACHRI study), which would automatically be excluded by users with POA data. Adjusting for the availability of POA data, the estimated PPV in the 2008 NACHRI study was 86%. The remaining false positives were largely attributable to confusion over skin irritation or breakdown, due to friction or tape, versus pressure-related injury. Coding variation was especially notable in small infants, who have since been excluded from the PDI 02 denominator.

No data about the sensitivity of PDI 02 are available at this time, although the limited data available for PSI 03 suggests a need for further study.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

Bardach NS, Chien AT, Dudley RA. Small numbers limit the use of the inpatient pediatric quality indicators for hospital comparison. Acad Pediatr. 2010 Jul-Aug;10(4):266-73. PubMed

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

McDonald K, Romano P, Davies S, Haberland C, Geppert J, Ku A, Choudhry K. Measures of pediatric health care quality based on hospital administrative data: the pediatric quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Sep. 130 p. [82 references]

National Quality Forum measure information: pressure ulcer rate (PDI 2). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 16 p.

Scanlon MC, Harris JM 2nd, Levy F, Sedman A. Evaluation of the agency for healthcare research and quality pediatric quality indicators. Pediatrics. 2008 Jun;121(6):e1723-31. PubMed

Scanlon MC, Miller M, Harris JM, Schulz K, Sedman A. Targeted chart review of pediatric patient safety events identified by the Agency for Healthcare Research and Qualityâ€™s patient safety indicators methodology. J Patient Saf. 2006;2:191-7.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age less than or equal to 17 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

User may specify the time window; generally one calendar year.

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Institutionalization

Patient/Individual (Consumer) Characteristic

Therapeutic Intervention

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Surgical and medical discharges for patients ages 17 years and younger. Surgical and medical discharges are defined by specific Diagnosis-Related Group (DRG) or Medicare Severity-DRG (MS-DRG) codes.

Note: Refer to the original measure documentation for DRG and MS-DRG codes. See also the *Pediatric Quality Indicators Appendices*.

Exclusions
Exclude cases:

- With a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for pressure ulcer (see above)
- With any secondary ICD-9-CM diagnosis codes for pressure ulcer (see above) present on admission and any secondary ICD-9-CM diagnosis codes for pressure ulcer stage III or IV (or unstageable, see above) present on admission
- With any-listed ICD-9-CM procedure codes for debridement or pedicle graft before or on the same day as the major operating room procedure (surgical cases only)
- With any-listed ICD-9-CM procedure codes for debridement or pedicle graft as the only major

operating room procedure (surgical cases only)
Neonates
With length of stay of less than five (5) days
Transfer from a hospital (different facility)
Transfer from a Skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF)
Transfer from another health care facility
Major Diagnostic Categories (MDC) 9 (skin, subcutaneous tissue, and breast)
MDC 14 (pregnancy, childbirth, and puerperium)
With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for pressure ulcer stage III or IV (or unstageable)

Note: Refer to the original measure documentation for ICD-9-CM codes.

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Adverse Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Measure is disaggregated into categories based on different definitions of the denominator and/or numerator

Basis for Disaggregation

This measure includes metrics for discharges grouped by the following risk categories:

Numerator

> High Risk Category: Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for pressure ulcer and any secondary ICD-9-CM diagnosis codes for pressure ulcer stage III or IV (or unstageable).
> Low Risk Category: Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary ICD-9-CM diagnosis codes for pressure ulcer and any secondary ICD-9-CM diagnosis codes for pressure ulcer stage III or IV (or unstageable).

Denominator

> High Risk Category: Surgical and medical discharges, for patients ages 17 years and younger, with any-listed ICD-9-CM diagnosis codes for hemiplegia, paraplegia, or quadriplegia or any-listed ICD-9-CM diagnosis codes for spina bifida or any-listed ICD-9-CM diagnosis codes for anoxic brain damage or any-listed ICD-9-CM procedure codes for continuous mechanical ventilation. Surgical and medical discharges are defined by specific Diagnosis-Related Group (DRG) or Medicare Severity-DRG (MS-DRG) codes.
> Low Risk Category: Surgical and medical discharges, for patients ages 17 years and younger, without any-listed ICD-9-CM diagnosis codes for hemiplegia, paraplegia, or quadriplegia and without any-listed ICD-9-CM diagnosis codes for spina bifida and without any-listed ICD-9-CM diagnosis codes for anoxic brain damage and without any-listed ICD-9-CM procedure codes for continuous mechanical ventilation. Surgical and medical discharges are defined by specific DRG or MS-DRG codes.

Refer to the original measure documentation for additional information.

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, birthweight (500g groups), age in days (29 to 60, 61 to 90, 91+), age in years (in 5-year age groups), modified Centers for Medicare & Medicaid Services (CMS) Diagnosis-Related Group (DRG), and Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software (CSS) comorbidities. The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2008, a database consisting of 43 states and approximately 6 million pediatric discharges. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate,

multiplied by the reference population rate.

Refer to the original measure documentation for the covariates used in this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PDI 2: pressure ulcer rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Pediatric Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2015 Oct 21

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

> AHRQ QI. Pediatric quality indicators #2: technical specifications. Pressure ulcer rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 3 p.
> AHRQ quality indicators. Pediatric quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 61 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site .

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Pediatric quality indicators (PDI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 98 p. This document is available from the AHRQ Quality Indicators Web site .
ARHQ quality indicators. Pediatric quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 13 p. This document is available from the AHRQ Quality Indicators Web site
AHRQ quality indicators. Pediatric quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available in PDF from the AHRQ Quality Indicators Web site .
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site .

NQMC Status

This NQMC summary was completed by ECRI Institute on December 28, 2007. The information was verified by the measure developer on March 31, 2008.

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Copyright Statement

No copyright restrictions apply.

Production

Source(s)

AHRQ QI research version 5.0. Pediatric quality indicator 2 technical specifications: pressure ulcer rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 5 p.

National Quality Forum measure information: pressure ulcer rate (PDI 2). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 16 p.

Disclaimer

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