



HEALTHGRADES®

Pediatric Patient Safety Methodology 2010 (2006-2008 Data)

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The Pediatric Patient Safety Excellence Award™ recognize pediatric centers that have the lowest rates of potentially avoidable complications and adverse events following surgeries and procedures for pediatric patients. To help consumers evaluate and compare pediatric patient safety at hospitals, HealthGrades analyzed pediatric patient outcome data for all patients (all-payer data) provided by 19 individual states for years 2006 through 2008. This methodology describes how HealthGrades:

- Calculates a **pediatric patient safety ranking score** for each hospital
- Designates **Pediatric Patient Safety Excellence Awards™** recipients based on the pediatric patient safety ranking score

To evaluate hospital pediatric patient safety, HealthGrades uses all-payer state data and Patient Safety Indicator software (version 3.2 for Windows) from the Agency for Healthcare Research and Quality (AHRQ) to analyze the following eight pediatric patient safety indicators (PDI) which are types of preventable hospital complications.

- Accidental Puncture or Laceration (PDI 1)
- Pressure Ulcer (PDI 2)
- Iatrogenic Pneumothorax (PDI 5)
- Postoperative Hemorrhage or Hematoma (PDI 8)
- Postoperative Respiratory Failure (PDI 9)
- Postoperative Sepsis (PDI 10)
- Postoperative Wound Dehiscence (PDI 11)
- Selected Infections Due to Medical Care (also known as: Central Venous Catheter-Related Bloodstream Infections) (PDI 12)

These eight indicators are utilized based on the recommendation of AHRQ Pediatric Quality Indicators Composite Measure Workgroup.¹

For most indicators, the AHRQ software uses advanced statistical algorithms that can predict the number of pediatric patient safety incidences that are likely to occur at a hospital based on the types of patients treated at that hospital. This information is used, in part, to determine a HealthGrades overall pediatric patient safety score for a hospital.

Data Acquisition

For the pediatric patient safety scores, all-payer state data were used for those states where state data are available. These data were chosen because they represent virtually all discharges (all ages) for the associated states. The data represent three years of discharges (2006 through 2008). The 19 states evaluated were:

- Arizona
- California
- Colorado
- Florida
- Iowa
- Maine
- Maryland
- Massachusetts
- New Jersey
- New York
- North Carolina
- Oregon
- Pennsylvania
- Rhode Island
- Texas
- Utah
- Virginia
- Washington
- Wisconsin

Determining the Pediatric Patient Safety Ranking Score

To be eligible for a pediatric patient safety ranking score, a hospital must have had outcomes in six of the eight pediatric patient safety indicators and they must have had at least 30 cases considered for the Accidental Puncture or Laceration indicator in the most recent data year (2008).

To determine the overall pediatric patient safety ranking score by hospital, HealthGrades statistically compared the **actual** rate to the **predicted** rate for each individual pediatric patient safety indicator to produce a score for each pediatric patient safety indicator. The overall pediatric patient safety ranking score was then calculated as the average of the eight individual pediatric patient safety scores; the overall patient safety score was then used to determine the hospital's ranking.

The following is a detailed description of the steps HealthGrades performed to determine the overall patient safety score.

1. HealthGrades used the AHRQ software to calculate observed and expected rates for each hospital and each pediatric patient safety indicator, provided that the pediatric patient safety indicator had at least one case.
2. Since HealthGrades identified significant bias in the expected rates for larger hospitals and hospitals with a pediatric heart surgery program (which had consistently higher observed rates than expected); HealthGrades performed further risk adjustment using the heart surgery volume and Pediatric Case Mix Index (PCMI). The case mix index is a hospital-level indicator of the seriousness of the cases seen at a hospital—higher PCMI values indicate more seriously ill pediatric patients are seen at the hospital. Expected rates were adjusted to equal observed rates within four potential strata along with data year:

Strata	Pediatric Heart Surgery Volume	Pediatric Case Mix Index
1	0 to 29	< 1.25
2	0 to 29	>1.25
3	30+	<1.50
4	30+	>1.50

The pediatric case mix index/heart surgery volume adjustment compensates for the fact that within a given DRG the most severely ill will probably be clustered at children's and larger community hospitals. The pediatric case mix index is a hospital-level indicator of the seriousness of the cases seen at a hospital—higher PCMI values indicate more seriously ill patients are seen at the hospital.

Due to low event counts in some PDIs, all stratifications were not used. For example, post-op wound dehiscence, an extremely rare event, was only stratified by data year. The following illustrates the strata applied to each indicator.

Pediatric Patient Safety Indicator (PDI)	Stratification Used
Accidental Puncture or Laceration (PDI 1)	Year, Heart Surgery Volume, PCMI
Pressure Ulcer (PDI 2)	Year, PCMI
Iatrogenic Pneumothorax (PDI 5)	Year, Heart Surgery Volume, PCMI
Postoperative Hemorrhage or Hematoma (PDI 8)	Year, Heart Surgery Volume
Postoperative Respiratory Failure (PDI 9)	Year, Heart Surgery Volume
Postoperative Sepsis (PDI 10)	Year, Heart Surgery Volume, PCMI
Postoperative Wound Dehiscence (PDI 11)	Year
Selected Infections Due to Medical Care (PDI 12)	Year, Heart Surgery Volume, PCMI

- Once the expected rates were adjusted according to strata, HealthGrades statistically compared the observed rate to the expected rate to produce a z-score for each pediatric patient safety indicator. To equalize the effect of the eight indicators, these z-scores were rescaled to a mean of zero and standard deviation of one. The pediatric patient safety ranking score was then calculated as the average of the eight resulting scores.
- Because of the small number of pediatric patient safety events, an additional requirement was imposed that the combined events must be statistically significant. For each hospital, the total number of events and the total expected events across eight pediatric patient safety indicators was calculated, and an overall z-score was calculated as follows:

$$\text{Overall z-score} = (\text{expected event} \textit{ minus} \textit{ the observed events}) / \textit{ standard deviation.}$$

5. The best-performing hospitals were then identified by evaluating the overall z-score. When a hospital is rated **Best** in pediatric patient safety, it means that their pediatric patient safety record is better than expected given their patient population. Specifically, their overall z-score is greater than 1.645, and their pediatric ranking score is in the top 20% of hospitals that qualify for a pediatric patient safety rating.

Designating 2010 Pediatric Patient Safety Excellence Award™ Recipients

To be considered for a Pediatric Patient Safety Excellence Award™, hospitals had to have an overall patient safety score. That is, the hospital must have had outcomes in six of the eight pediatric patient safety indicators and they must have had at least 30 cases considered for the Accidental Puncture or Laceration indicator in the most recent data year. The final data set of hospitals that met these qualifications included 1,530 hospitals. Hospitals were then ranked based on their **overall pediatric patient safety score**. The eligible hospitals were then rank ordered by their average z-score and the top 20% of eligible hospitals that also had overall z-scores > 1.645 were recognized with a HealthGrades Pediatric Patient Safety Excellence Award.

Limitations of the Data Models

It must be understood that while these models may be valuable in identifying hospitals that perform better than others, one should not use this information alone to determine the quality of care provided at each hospital. The models are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- The models can only account for risk factors that are coded into the billing data. Therefore, if a particular risk factor was not coded into the billing data (such as a patient's socioeconomic status and health behavior) then it was not accounted for with these models.
- Although HealthGrades has taken steps to carefully compile these data, no techniques are infallible; and therefore, some information may be missing, outdated or incorrect.

Please note that if more than one hospital reported to CMS under a single provider ID, HealthGrades analyzed patient safety data for those hospitals as a single unit. Throughout this document, therefore, "hospital" refers to one hospital or a group of hospitals reporting under a single provider ID.

References

- 1 Agency for HealthCare Quality and Research. Agency for HealthCare Research and Quality Pediatric Quality Indicators Composite Measure Working Group Final Report March 2008. Available at: http://www.qualityindicators.ahrq.gov/downloads/pdi/AHRQ_PDI_Workgroup_Final.pdf. Accessed April 26th, 2010.