



HEALTHGRADES®

Patient Safety Methodology 2010 (2006-2008 MedPAR Data)

Patient Safety ratings reflect the quality of care at a hospital by measuring how well the hospital prevents potentially avoidable complications and adverse events following surgeries and procedures. To help consumers evaluate and compare hospital patient safety, HealthGrades analyzed patient data for virtually every hospital in the country. This methodology describes how HealthGrades:

- Determines **individual patient safety ratings**
- Calculates an **overall patient safety score** for each hospital
- Designates **Patient Safety Excellence Awards™** based on the overall patient safety score

To evaluate hospital patient safety, HealthGrades uses Medicare inpatient data from the Medicare Provider Analysis and Review (MedPAR) database and Patient Safety Indicator software from the Agency for Healthcare Research and Quality (AHRQ) to analyze the following 12 patient safety indicators (PSI) which are types of preventable hospital complications.

Patient Safety Indicator	Translated in HealthGrades Reports as...
Death in low mortality Diagnostic Related Groupings (DRGs)	Prevention of death in procedures where mortality is usually very low
Decubitus ulcer	Lack of pressure sores or bed sores acquired in the hospital
Failure to rescue (known as, "Death among surgical inpatients with serious treatable complications")	Ability to diagnose and treat in time
Iatrogenic pneumothorax	Avoidance of collapsed lung due to a procedure or surgery in or around the chest
Selected infections due to medical care	Lack of infections acquired at the hospital
Post-operative hip fracture	Absence of hip fracture after surgery
Post-operative hemorrhage or hematoma	Avoidance of excessive bruising or bleeding as a consequence of a procedure or surgery
Post-operative physiologic and metabolic derangements	Adequate organ function and electrolyte and fluid imbalance after surgery
Post-operative respiratory failure	Avoidance of respiratory failure following surgery
Post-operative pulmonary embolism or deep vein thrombosis	Lack of deep blood clots in the lungs or legs after surgery
Post-operative sepsis	Avoidance of severe infection following surgery
Post-operative abdominal wound dehiscence	Lack of surgical wound site breakdown

For most indicators, the AHRQ software uses advanced statistical algorithms that can predict the number of patient safety incidences that are likely to occur at a hospital based on the types of patients treated at that hospital. For indicators that the AHRQ software does not provide predicted results, predicted results were generated by grouping the patient populations according to risk, and assigning average group values to patients in each group. This information is used, in part, to determine a HealthGrades individual patient safety rating for each patient safety indicator and an overall patient safety score for a hospital.

Data Acquisition

HealthGrades uses Medicare inpatient data from the Medicare Provider Analysis and Review (MedPAR) database purchased from the Centers for Medicare and Medicaid Services (CMS) for several reasons.

- The MedPAR file includes inpatient data from virtually every hospital in the country, with the exception of military and Veterans Administration hospitals.
- Hospitals are required by law to submit complete and accurate information with substantial penalties for those that report inaccurate or incomplete data.
- The Medicare population represents a majority of adult inpatient admissions.

HealthGrades evaluated all short-term acute care hospitals in the MedPAR file for three years (2006 through 2008) following all AHRQ guidelines for using their patient safety indicator software. Specifically, HealthGrades used the QI Windows Software, version 3.2, developed by the AHRQ and downloaded from <http://www.qualityindicators.ahrq.gov/software.htm>.

Data Exclusions

“Foreign body left in during a procedure” was not utilized as one of the indicators. This patient safety indicator requires a “present on admission indicator,” which was left blank or not coded accurately for a majority of patients in the fiscal year 2008 data when the indicator first became available.

Given that the MedPAR file applies mostly to patients over the age of 65, HealthGrades excluded the following patient safety indicators from the analysis:

- Birth trauma – injury to neonate
- Obstetric trauma – cesarean delivery
- Obstetric trauma – vaginal delivery with instrument
- Obstetric trauma – vaginal delivery without instrument

Due to coding variation in the use of E codes, HealthGrades excluded three additional indicators:

- Complications of anesthesia
- Accidental puncture or laceration
- Transfusion reaction

Additionally, HealthGrades modified the “Failure to rescue” patient group by excluding cancer patients—patients having any ICD-9 code between 140.0 and 208.9 or between 230.0 and 239.9. (AHRQ now refers to “Failure to rescue,” as “Death among surgical inpatients with serious treatable complications.”) HealthGrades also removed hospitals in the U.S. territories and Puerto Rico from the data set.

Determining Individual Patient Safety Indicator Scores and Ratings

To determine a patient safety indicator score for each of the 12 patient safety indicators for each hospital, HealthGrades statistically compared the **actual** rate of individual patient safety events to the **predicted** rate. HealthGrades then displays if the patient safety rating is Best, Average or Poor.

- **Best** – Fewer patients were affected than expected.
- **Average** – About the same number of patients were affected as expected.
- **Poor** – More patients were affected than expected.

When a hospital is not rated, it means the hospital had **too few cases** to be eligible to receive a patient safety rating.

HealthGrades also tracks the number of patients (out of 1,000 patients that met the inclusion criteria) who experienced the problem. For example, 10 per 1,000 means that for every 1,000 patients, only 10 were affected; whereas zero (0) indicates that no patients were affected. Each patient safety indicator is rated independently and some indicators apply to more patients than others. Some patient safety events occur more frequently than others. As a result, the number of patients affected for each indicator may vary substantially.

Determining the Overall Patient Safety Score

To be eligible for an overall patient safety score, a hospital must have had outcomes in nine of the 12 patient safety indicators. Hospitals with eight or fewer patient safety ratings were not eligible to receive an overall patient safety score, but may have individual patient safety indicator ratings.

To determine the overall patient safety score by hospital, HealthGrades statistically compares the **actual** rate to the **predicted** rate for each individual patient safety indicator to produce a score for each patient safety indicator. The overall patient safety score was then calculated as the average of the 12 individual patient safety scores, and the overall patient safety score is used to determine the hospital's ranking.

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

1. HealthGrades uses the AHRQ software to calculate observed and expected rates for each hospital and each patient safety indicator, provided that the patient safety indicator had at least one case. (HealthGrades used a stratification process to calculate expected rates for those patient safety indicators where AHRQ software only provided observed rates.)
2. Since HealthGrades identified significant bias in the expected rates for larger hospitals (which had consistently higher observed rates than expected); HealthGrades performed further risk adjustment using the Medicare Case Mix Index (CMI). The case mix index adjustment compensates for the fact that within a given DRG the most severely ill will probably be clustered at larger hospitals. The case mix index is a hospital-level indicator of the seriousness of the cases seen at a hospital—higher CMI values indicate more seriously ill patients are seen at the hospital.

To perform the case mix index adjustment and remove the bias, HealthGrades stratified hospitals into one of eight categories according to their case mix index and then adjusted the expected values so that the sum of the expected equaled the sum of the observed for each patient safety indicator for each combination of the case mix index group and year.

Case Mix Index	Case Mix Index Group
0.00 < CMI < 1.25	1
1.25 < CMI < 1.35	2
1.35 < CMI < 1.45	3
1.45 < CMI < 1.55	4
1.55 < CMI < 1.65	5
1.65 < CMI < 1.75	6
1.75 < CMI < 1.90	7
CMI > 1.90	8

- HealthGrades statistically compared the observed rate to the expected rate to produce a z-score for each patient safety indicator. To normalize the effect of the 12 indicators, these z-scores were rescaled to a mean of zero and standard deviation of one. The overall patient safety score was then calculated as the average of the 12 resulting scores, and this score is used to determine a hospital's ranking.



Designating 2010 Patient Safety Excellence Award Recipients

To be considered for a Patient Safety Excellence Award™, hospitals had to be rated in at least 16 of 26 HealthGrades cohorts and have a current overall HealthGrades star rating of at least 2.5. The final data set of hospitals that met these qualifications included 740 teaching hospitals and 848 non-teaching hospitals. Hospitals in each group were then ranked based on their **overall patient safety score** (as explained above).

To identify the teaching peer group, HealthGrades used data from the Medicare Cost Reports (Form CMS-2552-96). A facility was considered a teaching hospital if they answered "yes" to the question: "Does the hospital have a teaching program approved in accordance with CMS publication 15-1, Chapter 4?" As a further confirmation, the hospital was required to report either Indirect Medical Education (IME) payments or FTEs for residents on the Cost Report. When the Cost Report data were unavailable or contradictory, IME from the MedPAR file and the COTH (Council of Teaching Hospitals) list were used to determine status.

HealthGrades then identified both teaching and non-teaching hospitals in the top 15% as "best performing" and these hospitals were selected to be HealthGrades Patient Safety Excellence Award recipients. These 238 hospitals represent less than 5% of the total hospitals evaluated.

Hospital Type	Number of Best Performing Providers
Teaching Hospitals	111
Non-teaching Hospitals	127

The Patient Safety Excellence Award recipients were categorized according to their 2008 case mix index as follows.

Case Mix Index	Case Mix Index Group	# of Award Recipients
0.00 < CMI < 1.25	1	5
1.25 < CMI < 1.35	2	18
1.35 < CMI < 1.45	3	35
1.45 < CMI < 1.55	4	29
1.55 < CMI < 1.65	5	46
1.65 < CMI < 1.75	6	43
1.75 < CMI < 1.90	7	43
CMI > 1.90	8	19

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.