The Sixth Annual HealthGrades Patient Safety in American Hospitals Study

April 2009

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In this sixth annual study, HealthGrades identifies patient safety incidence rates among Medicare patients at virtually all of the nation's 5,000 non-federal hospitals. Additionally, HealthGrades identifies the best-performing hospitals to establish a best-practice benchmark against which other hospitals can be evaluated (Appendix A lists these best-performing hospitals). This study also examines trends in important patient safety issues among the nation's hospitals. Specific results for each of the nation's non-federal hospitals can be found at www.healthgrades.com.

Executive Summary

For the sixth consecutive year, HealthGrades has analyzed patient safety among Medicare patients in all U.S. hospitals based on 15 indicators of patient safety. Patient safety has been an area of intense focus for hospitals over the last several years. In particular, hospitals have increasingly implemented strategies aimed at reducing preventable patient safety events. Of the nearly 5,000 hospitals nationwide, approximately 4,000 participated in the Institute for Healthcare Improvement (IHI) 5 Million Lives Campaign consisting of 12 strategies to reduce unintended harm to patients.[1]

While U.S. hospitals are diligently working to adopt safe practices, the federal government is also encouraging hospitals to adopt these safe practices by establishing a zero-tolerance policy for preventable hospital-acquired complications. As of October 2008, the Centers for Medicare and Medicaid (CMS) no longer reimburse hospitals for the care of 11 conditions if they are a direct result of the hospitalization. Nine additional conditions may be added to the list in the fall of 2009.[2]

The Institute for Healthcare Improvement estimates 40,000 instances of medical harm occur in the healthcare delivery system daily.

With all this emphasis on patient safety in U.S. hospitals, consumers should be encouraged about the steps being taken to prevent medical mistakes. While hospitals have made progress, medical mistakes still occur at an alarming rate. The IHI estimates 40,000 instances of medical harm occur in the healthcare delivery system daily.[1] For this reason, HealthGrades independently analyzes U.S. hospitals' historical patient safety performance and makes that information available to patients and their families to consider when making difficult healthcare decisions.

HealthGrades used patient safety indicators from the Agency for Healthcare Research and Quality (AHRQ)[3] to identify the patient safety incidence rates for every non-federal hospital in the country using three years of Medicare data (2005–2007). In addition to identifying the rates of patient safety events, HealthGrades created a composite score to identify the best-performing hospitals in the U.S. from 2005 through 2007. These hospitals were recognized with the HealthGrades 2009 Patient Safety Excellence Award™.

Summary of Findings

The Agency for Healthcare Research and Quality (AHRQ) developed the patient safety indicators (PSIs) based on the Institute of Medicine's definition of patient safety—"**freedom from accidental injury due to medical care, or medical errors**."[4] Medical error is defined as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim…[including] problems in practice, products, procedures, and systems."[5]

In 2002 AHRQ, in collaboration with the University of California–Stanford Evidence-Based Practice Center, identified 20 indicators of potentially preventable patient safety events that could be readily identified in hospital discharge data. This tool set of 20 evidence-based PSIs was created and released to the public in 2003 to be used by various healthcare stakeholders to assess and improve patient safety in U.S. hospitals.[3]

For the first part of this study, HealthGrades used the Patient Safety Indicator QI Windows Software, version 3.2, developed by AHRQ.[3] In addition to the PSI software application, HealthGrades used previous research by Zhan and Miller[6] to study the attributable mortality and cost associated with each of 15 PSIs among Medicare beneficiaries from 2005 through 2007. The 15 PSIs we studied are listed in *Appendix B*. (Four obstetrics indicators and absence of foreign body indicator were not used in this study.)

For the second part of this study, using the rates calculated for 12 of the 15 PSIs studied (three are for regional use only and thus excluded from the comparative hospital analysis), we also calculated an overall patient safety composite score for each hospital to identify the best-performing hospitals in the U.S. from 2005 through 2007 (see *Appendices A* and *C*). These best-performing hospitals were recognized with the HealthGrades 2009 Patient Safety Excellence Award™.

Patient safety events cost the federal Medicare program $6.9 billion and resulted in 92,882 potentially preventable deaths from 2005 through 2007.

From 2005 through 2007:

- There were 913,215 total patient safety events among 864,765 Medicare beneficiaries which represents 2.3 percent of the nearly 38 million Medicare hospitalizations.
- These patient safety events were associated with over $6.9 billion of excess cost.
- The overall incidence rate remained virtually unchanged compared to last year's study (except the failure to rescue indicator for which there were major methodological changes).
- Eight indicators showed improvement over the course of the study.
  - Complications of anesthesia, death in low mortality DRGs, failure to rescue, iatrogenic pneumothorax, selected infections due to medical care, post-operative hip fracture, post-operative hemorrhage or hematoma, and transfusion reaction showed improvement ranging from 2.3 percent to 52.0 percent.
  - These eight indicators accounted for 14.5 percent of the total patient safety events during the study period.
- Seven indicators worsened over the course of the study.
  - Decubitus ulcer (bed sores), post-operative physiological and metabolic derangements, post-operative respiratory failure, post-operative pulmonary embolism (potentially fatal blood clots forming in the lungs) or deep vein thrombosis (blood clots in the legs), post-operative sepsis, post-operative abdominal wound dehiscence, and accidental puncture or laceration all worsened with changes ranging from a one-percent increase in events to 23.4 percent.
  - These seven indicators accounted for 85.5 percent of the total patient safety events during the study period.

- Medical errors with the highest incidence rates were failure to rescue (death among surgical inpatients with serious treatable complications), decubitus ulcer, post-operative respiratory failure, and post-operative sepsis. The event rates per 1,000 patients were: 96.2, 32.0, 17.2, and 14.9 respectively (see *Appendix D*).
- There were 97,755 actual inhospital deaths that occurred among patients who experienced one or more of the 15 patient safety events (*Appendix D*).
  - Note: In last year's study, failure to rescue accounted for 188,329 patient deaths.[7] Major changes to this indicator (i.e., no longer including non-surgical patients or patients with acute renal failure) account for the drastic drop in mortality from last year's study, making any conclusion about overall improvement between the two study periods problematic.
  - Medicare patients who experienced one or more of the 15 patient safety events had approximately a one-in-ten chance of dying as a result of an event from 2005 through 2007.
  - Applying previous research conducted by Zhan and Miller, 92,882 of these deaths could be directly attributable to a patient safety event.

Medicare patients who experienced one or more patient safety events had a one-in-ten chance of dying from 2005 through 2007.

- Wide and highly significant gaps in individual PSIs and overall performance exist between hospitals that were recognized with a Patient Safety Excellence Award™ versus bottom-ranked hospitals.
  - Medicare patients treated at hospitals recognized with a Patient Safety Excellence Award™ had, on average, a 43-percent lower risk of experiencing one or more of the PSIs studied compared to patients treated at bottom-ranked hospitals (range: 30.04% to 52.67%, see *Appendix F*).
- If all hospitals had performed at the level of hospitals recognized with a Patient Safety Excellence Award™, approximately 211,697 patient safety events and 22,771 Medicare deaths could potentially have been avoided while saving the U.S. healthcare system approximately $2.0 billion from 2005 through 2007 (see *Appendix F*).

If all hospitals had performed at the level of Patient Safety Excellence Award™ hospitals, approximately 211,697 patient safety events and 22,771 Medicare deaths could have been avoided, saving approximately $2.0 billion from 2005 through 2007.

Methodology Brief

HealthGrades used Medicare inpatient data from the Medicare Provider Analysis Review (MedPAR) data file (purchased from CMS; 2005 through 2007 data) and Patient Safety Indicator software (QI Windows Software, version 3.2) from AHRQ.

1 We first calculated the national rates for 15 of the 20 AHRQ PSIs—four of the obstetrics indicators and absence of foreign body left in during procedure indicator were not used (see *Appendix B* for a listing of indicators).

2 Secondly, in order to evaluate overall hospital performance and identify the best-performing hospitals for patient safety across the U.S., we used the same software to evaluate every hospital in the country on 12 PSIs (see *Appendix C* for a listing of indicators).

To minimize the potential impact of variations in hospital coding of specific E-codes, we excluded three PSIs (complications of anesthesia, accidental puncture or laceration, and transfusion reaction) that included these specific E-codes in their numerator definition. We also excluded absence of foreign body, as changes to the AHRQ software now require a present on admission flag which isn't available in the Medicare 2005 – 2007 data.

3 We then developed a ranking methodology to evaluate overall patient safety performance for hospitals having a measure in a minimum of nine out of 12 indicators. In addition, 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. These eligible hospitals' relative performances were determined by calculating the z-score for each patient safety indicator and then averaging the 12 z-scores. These averaged z-scores by hospital were then rank ordered within their respective peer group (teaching and non-teaching) from most positive (best) to most negative (worst). The top 15 percent of eligible hospitals were identified as Patient Safety Excellence Award™ recipients (see *Appendix C* for complete details). This final group of 242 hospitals represents less than five percent of the nation's nearly 5,000 hospitals initially studied.

4 Lastly, mortality and cost attributable to patient safety events were extrapolated using attributable charge and mortality associated with the development of a patient safety event from previous PSI research by Zhan and Miller.[6]

Detailed Findings

Patient Safety Events are Common in U.S. Hospitals

Medicare patients who experienced one or more patient safety events had a one-in-ten chance of dying from 2005 through 2007.

HealthGrades identified a total of 913,215 patient safety events that occurred in 38,227,561 acute care hospitalizations in the Medicare population from 2005 through 2007 (see *Appendix D*). These events occurred among 864,765 unique patients. This means that among hospitalized Medicare patients, 2.26 percent experienced one or more of the 15 patient safety events. Medicare patients who experienced one or more patient safety events had a one-in-ten chance of dying. In fact, there were 97,755 actual inhospital deaths that occurred among patients who experienced one or more of the 15 patient safety events.

In last year's study, the number of inhospital deaths attributable to patient safety events was almost 200,000.[7] However, AHRQ redefined the failure to rescue indicator (no longer including non-surgical patients or patients with acute renal failure) which reduced the number of patients studied for this indicator from 1.5 million to 154,892. Excluding the failure to rescue indicator, there was virtually no change in the rate per 1,000 for each of the indicators studied compared to last year's study.[7]

Common Patient Safety Events are Very Costly

Three PSIs with the highest incidence rates – failure to rescue, decubitus ulcer, and post-operative respiratory failure – accounted for 57.80 percent of all patient safety events from 2005 through 2007 (see *Table 1* below). Failure to rescue rates improved 5.54 percent during the study period while both decubitus ulcer and post-operative respiratory failure worsened by 7.78 and 2.45 percent respectively. For the incidence rates and associated rate change of all 15 PSIs, see *Appendix D*. For the excess mortality and costs attributable to each PSI, see *Appendix E*.

Table 1: Most Commonly Occurring Patient Safety Indicators per 1,000 At-Risk Hospitalizations

Patient Safety Indicator	Incidence Rate per 1,000 At-Risk Hospitalizations	Excess Cost Attributable to PSI (Billion)
Failure to rescue	96	NA*
Decubitus ulcer	32	$2.41
Post-operative respiratory failure	17	$1.82

* By definition, all patients with the event died and were excluded from Zhan and Miller's analysis on attributable mortality and cost associated with PSIs.

Patient safety events are not only common, but costly. Using cost numbers from the Zhan and Miller research, we estimate that the 15 patient safety indicators studied cost the U.S. healthcare system $6.9 billion from 2005 through 2007 (see *Appendix E*). The two most common indicators, decubitus ulcer and post-operative respiratory failure, accounted for 61.2 percent of this $6.9 billion.

Eight patient safety indicators showed improvement while seven indicators worsened in 2007 compared to 2005.

Less Improvement Seen Among Most Common Events

Eight of 15 PSIs studied showed improvement from 2005 through 2007 (complications of anesthesia, death in low mortality DRGs, failure to rescue, iatrogenic pneumothorax, selected infections due to medical care, post-operative hip fracture, post-operative hemorrhage or hematoma, and transfusion reaction). These eight indicators improved, on average, 14.06 percent (range: 2.27% to 51.99%). Complications of anesthesia, failure to rescue, death in low mortality DRGs, and selected infections due to medical care were associated with the greatest improvements in 2007 compared to 2005, excluding the relative improvement associated with the very rare occurrence of transfusion reaction (see *Appendix D*). While these indicators showed improvement over the study period, these indicators combined accounted for only 14.51 percent of the total patient safety events.

Seven indicators (decubitus ulcer, post-operative physiologic and metabolic derangements, post-operative respiratory failure, post-operative pulmonary embolism or deep vein thrombosis, post-operative sepsis, post-operative abdominal wound dehiscence, and accidental puncture or laceration) showed worsening in 2007 when compared to 2005 (range: -23.40% to -0.59%) (see *Appendix D*). These seven indicators combined account for 85.49 percent of all the patient safety events during the study period.

Approximately One-in-Ten Medicare Patients with Patient Safety Events Died

There were 97,755 actual inhospital deaths that occurred among patients who experienced one or more of the 15 patient safety events (*Appendix D*). These deaths represent all-cause mortality among patients that experienced one or more of these patient safety events. To examine the direct relationship between the event and mortality, we utilized previous work by Zhan and Miller[6] to calculate the deaths directly attributed to these patient safety events. Applying Zhan and Miller's research to the patient safety event rate, we estimate that 92,882 deaths could potentially have been avoided. This translates to a 10.74 percent potentially preventable mortality rate among hospitalized Medicare patients who experienced at least one patient safety event from 2005 through 2007 (see *Appendix E*).

Large Safety Gaps Identified Between Poorest- and Best-Performing Hospitals

The first part of this study examined the overall impact of 15 patient safety indicators across the nation's hospitals. The second part of this study identified the best-performing hospitals to establish a best-practice benchmark against which other hospitals could be evaluated. Best-performing hospitals were identified as the top 15 percent of ranked hospitals based on overall hospital performance and were recognized with the HealthGrades 2009 Patient Safety Excellence Award™.

To be considered for the overall patient safety performance assessment, hospitals had to be rated in nine of the 12 PSIs used in the study, be full service hospitals (rated in at least 16 of 26 HealthGrades cohorts), and have a current overall HealthGrades star rating of at least 2.5, with 5.0 being the best possible overall star rating. (For more details, see *HealthGrades Hospital Report Cards™ Mortality and Complication Based Outcome Methodology* at www.healthgrades.com.)

The top 15 percent, or 242 hospitals, were recognized with a HealthGrades 2009 Patient Safety Excellence Award™.

The final ranking set included 749 teaching hospitals and 862 non-teaching hospitals. The top 15 percent, or 242 hospitals, were recognized with the HealthGrades 2009 Patient Safety Excellence Award™. These best-performing hospitals represent less than five percent of all U.S. hospitals examined in this study (see *Appendices A* and *C*).

Table 2: Best-Performing Hospitals by Hospital Type

Hospital Type	Number of Best-Performing Hospitals (Patient Safety Excellence Award™ Recipients)
Teaching Hospitals	112
Non-teaching Hospitals	130

Patients treated at best-performing hospitals had, on average, a 43% lower chance of experiencing one or more medical errors compared to poorest-performing hospitals.

We found that there were wide, highly significant gaps in individual PSI and overall performance between the hospitals recognized with the HealthGrades 2009 Patient Safety Excellence Award™ and the bottom-ranked hospitals. More specifically, we found that Patient Safety Excellence Award hospitals, as a group, significantly outperformed the bottom 15 percent hospitals on every PSI. We also found that Patient Safety Excellence Award hospitals, as a group, had an overall patient safety performance equating to, on average, a 42.82 percent lower risk of experiencing one or more patient safety events compared to the bottom 15 percent hospitals (see *Appendix F*). This finding of better performance was consistent across all 12 PSIs studied (range: 30.04% to 52.67% relative risk decrease) (see *Appendix F*).

Patient Safety Excellence Award™ Hospitals Associated with Significantly Fewer Safety Events, Associated Deaths and Cost

If all hospitals had performed at the level of Patient Safety Excellence Award™ hospitals, approximately 211,697 patient safety events and 22,771 Medicare deaths could have been avoided while saving the U.S. approximately $2.0 billion from 2005 through 2007 (see *Appendix F*).

If all hospitals had performed at the level of Patient Safety Excellence Award™ hospitals, approximately 211,697 patient safety events and 22,771 Medicare deaths could have been avoided, saving approximately $2.0 billion from 2005 - 2007.

Interpretation of Results

While many U.S. hospitals have taken extensive action to prevent medical errors, patient safety events are still common in U.S. hospitals. In this study, there were 913,215 patient safety events among Medicare beneficiaries from 2005 through 2007. While over half of the indicators studied showed improvement, the most commonly occurring events showed worsening rates during the three-year study period, indicating that there is still much work to be done.

The prevalence of likely preventable patient safety events is taking a costly toll on our healthcare systems—in both lives and dollars. Consider that in this study approximately two percent of Medicare patients experienced a preventable patient safety event during a hospitalization from 2005 through 2007. This two percent represents only 15 potential patient safety events. These 15 medical errors alone cost the federal Medicare program $6.9 billion and resulted in 92,882 potentially preventable deaths.

In a recent AHRQ survey about patient safety culture, caregivers from 519 hospitals, reported that:

- Mistakes made and caught before there was harm to the patient were reported 51 percent of the time.
- Mistakes made that were perceived to have no harm to the patient were reported 55 percent of the time.
- Mistakes that could harm the patient were reported 73 percent of the time.[8]

From this, one can surmise that the true impact of patient safety events in U.S. hospitals is much larger than this study represents. The 97,755 deaths and $6.9 billion likely represent a fraction of the number of avoidable patient safety deaths and associated costs. For this reason, patient safety continues to be an important focus for hospitals across the nation, national organizations such as IHI, and the federal government.

Additionally, in the AHRQ study, 60 percent of participants also reported that it is just by chance that more serious mistakes don't happen in their hospital.[8] Preventing mistakes by chance is no longer acceptable. When patients enter the healthcare system, they entrust their health and their lives to their caregivers. The healthcare system must continue to put systematic safe practices in place to ensure that the system created to save them doesn't unintentionally harm them. Hospitals must continue to study patient safety, design and enhance patient safety processes until there are zero events, and recognize that a two-percent error rate can no longer be status quo. Hospitals must also look to and learn from the leading hospitals – those hospitals with the lowest patient safety event rates.

Rather than rely on chance, hospitals can look to Patient Safety Excellence Award™ hospitals as a benchmark. Medicare patients treated at these hospitals have a 42.82 percent lower probability of experiencing a patient safety event. This doesn't happen by chance.

If all U.S. hospitals had performed at the same level as the Patient Safety Excellence Award™ hospitals, the U.S. healthcare system could have saved $2 billion and potentially prevented 22,771 deaths in just three years among Medicare cases alone.

Appendix A: HealthGrades 2009 Patient Safety Excellence Award™ Recipients

The following hospitals are recipients of this year's HealthGrades Patient Safety Excellence Award™* in 2009. Some of the Patient Safety Excellence Award™ recipients have multiple locations. In these cases, results for all locations were used in the analysis and each of the facilities is designated as a recipient of the award.

HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Alabama		
Southeast Alabama Medical Center	Dothan	Non-teaching
Trinity Medical Center	Birmingham	Teaching
Arizona		
Mayo Clinic Hospital	Phoenix	Teaching
Verde Valley Medical Center	Cottonwood	Non-teaching
Yavapai Regional Medical Center - West	Prescott	Non-teaching
Arkansas		
Mercy Medical Center	Rogers	Non-teaching
California		
Desert Valley Hospital	Victorville	Non-teaching
Eisenhower Medical Center	Rancho Mirage	Non-teaching
French Hospital Medical Center	San Luis Obispo	Non-teaching
Hoag Memorial Hospital Presbyterian	Newport Beach	Non-teaching
Mercy General Hospital	Sacramento	Teaching
Queen of the Valley	Napa	Non-teaching
Saint Elizabeth Community Hospital	Red Bluff	Non-teaching
Saint John's Hospital Health Center	Santa Monica	Non-teaching
Santa Barbara Cottage Hospital	Santa Barbara	Teaching
Sharp Memorial Hospital	San Diego	Non-teaching
including: Sharp Cabrillo Hospital	San Diego	Non-teaching
UCSF Medical Center	San Francisco	Teaching
Colorado		
Poudre Valley Hospital	Fort Collins	Teaching
Connecticut		
Danbury Hospital	Danbury	Teaching
Hospital of Saint Raphael	New Haven	Teaching
Lawrence & Memorial Hospital	New London	Teaching
Middlesex Hospital	Middletown	Teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Florida		
Boca Raton Community Hospital	Boca Raton	Non-teaching
Doctors Hospital of Sarasota	Sarasota	Non-teaching
Flagler Hospital	Saint Augustine	Non-teaching
Florida Hospital - Orlando	Orlando	Teaching
including: Winter Park Memorial Hospital	Winter Park	Teaching
Holy Cross Hospital	Fort Lauderdale	Non-teaching
Indian River Medical Center	Vero Beach	Non-teaching
JFK Medical Center	Atlantis	Teaching
Manatee Memorial Hospital	Bradenton	Non-teaching
Mercy Hospital	Miami	Teaching
Morton Plant Hospital	Clearwater	Teaching
Morton Plant Mease Healthcare Countryside	Safety Harbor	Non-teaching
Munroe Regional Medical Center	Ocala	Non-teaching
NCH Healthcare System	Naples	Non-teaching
Palm Beach Gardens Medical Center	Palm Beach Gardens	Non-teaching
Saint Luke's Hospital	Jacksonville	Teaching
Sarasota Memorial Hospital	Sarasota	Non-teaching
Venice Regional Medical Center	Venice	Non-teaching
Georgia		
Athens Regional Medical Center	Athens	Non-teaching
Houston Medical Center	Warner Robins	Non-teaching
Memorial Health University Medical Center	Savannah	Teaching
Northeast Georgia Medical Center	Gainesville	Non-teaching
including: Northeast Georgia Medical Center - Lanier Park Campus	Gainesville	Non-teaching
Northside Hospital	Atlanta	Non-teaching
Piedmont Fayette Hospital	Fayetteville	Non-teaching
Piedmont Hospital	Atlanta	Teaching
Saint Joseph's Hospital of Atlanta	Atlanta	Non-teaching
Idaho		
Saint Joseph Regional Medical Center	Lewiston	Non-teaching
Saint Luke's Regional Medical Center	Boise	Teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Illinois		
Alton Memorial Hospital	Alton	Non-teaching
Central DuPage Hospital	Winfield	Non-teaching
Elmhurst Memorial Hospital	Elmhurst	Non-teaching
St. Mary's Good Samaritan	Mount Vernon	Non-teaching
Morris Hospital and Healthcare Centers	Morris	Non-teaching
Northwest Community Hospital	Arlington Heights	Non-teaching
Palos Community Hospital	Palos Heights	Non-teaching
Provena Covenant Medical Center	Urbana	Teaching
Provena St. Mary's Hospital	Kankakee	Teaching
Riverside Medical Center	Kankakee	Non-teaching
Rockford Memorial Hospital	Rockford	Non-teaching
Saint Anthony's Health Center	Alton	Non-teaching
including: Saint Joseph's Hospital	Alton	Non-teaching
Saint Anthony's Memorial Hospital	Effingham	Non-teaching
Saint John's Hospital	Springfield	Teaching
Indiana		
Clark Memorial Hospital	Jeffersonville	Teaching
Community Hospital	Munster	Non-teaching
Deaconess Hospital	Evansville	Teaching
Lutheran Hospital of Indiana	Fort Wayne	Teaching
Memorial Hospital and Health Care Center	Jasper	Non-teaching
Memorial Hospital of South Bend	South Bend	Teaching
Saint Anthony Medical Center of Crown Point	Crown Point	Teaching
Saint Joseph Regional Medical Center - South Bend	South Bend	Teaching
Iowa		
Great River Medical Center	West Burlington	Non-teaching
Iowa Methodist Medical Center	Des Moines	Teaching
Mercy Medical Center of Clinton	Clinton	Non-teaching
Mercy Medical Center - Dubuque	Dubuque	Non-teaching
Mercy Medical Center - North Iowa	Mason City	Teaching
Kansas		
Hays Medical Center	Hays	Non-teaching
Via Christi Regional Medical Center	Wichita	Teaching
including: Saint Joseph Medical Center	Wichita	Teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Kentucky		
ARH Regional Medical Center - Hazard	Hazard	Teaching
St. Elizabeth Medical Center	Edgewood	Teaching
Western Baptist Hospital	Paducah	Non-teaching
Louisiana		
Lafayette General Medical Center	Lafayette	Non-teaching
Rapides Regional Medical Center	Alexandria	Teaching
St. Francis Medical Center	Monroe	Non-teaching
Terrebonne General Hospital	Houma	Non-teaching
Willis Knighton Medical Center	Shreveport	Teaching
Maryland		
Sacred Heart Hospital	Cumberland	Non-teaching
Saint Joseph Medical Center	Towson	Non-teaching
Washington County Hospital	Hagerstown	Non-teaching
Massachusetts		
Brigham and Women's Hospital	Boston	Teaching
Cooley Dickinson Hospital	Northampton	Non-teaching
Massachusetts General Hospital	Boston	Teaching
Newton-Wellesley Hospital	Newton	Teaching
North Shore Medical Center - Salem Hospital	Salem	Teaching
including: North Shore Medical Center - Union Hospital	Lynn	Teaching
Michigan		
Allegiance Health	Jackson	Non-teaching
Alpena Regional Medical Center	Alpena	Non-teaching
Crittenton Hospital Medical Center	Rochester	Non-teaching
Genesys Regional Medical Center	Grand Blanc	Teaching
Hackley Hospital	Muskegon	Non-teaching
Holland Hospital	Holland	Non-teaching
Marquette General Hospital	Marquette	Teaching
McLaren Regional Medical Center	Flint	Teaching
MidMichigan Medical Center - Midland	Midland	Teaching
Munson Medical Center	Traverse City	Teaching
Oakwood Heritage Hospital	Taylor	Non-teaching
Port Huron Hospital	Port Huron	Non-teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Minnesota		
Abbott - Northwestern Hospital	Minneapolis	Teaching
Fairview Southdale Hospital	Edina	Non-teaching
Healtheast Saint John's Hospital	Maplewood	Teaching
Mercy Hospital	Coon Rapids	Teaching
Methodist Hospital	Minneapolis	Teaching
Ridgeview Medical Center	Waconia	Non-teaching
Saint Cloud Hospital	Saint Cloud	Teaching
Saint Joseph's Hospital	Saint Paul	Teaching
Saint Luke's Hospital	Duluth	Teaching
United Hospitals	Saint Paul	Teaching
Mississippi		
Jeff Anderson Regional Medical Center	Meridian	Non-teaching
North Mississippi Medical Center	Tupelo	Teaching
Missouri		
Boone Hospital Center	Columbia	Non-teaching
Heartland Regional Medical Center	St. Joseph	Non-teaching
Jefferson Memorial Hospital	Crystal City	Non-teaching
Missouri Baptist Medical Center	Saint Louis	Teaching
North Kansas City Hospital	North Kansas City	Non-teaching
Northeast Regional Medical Center	Kirksville	Teaching
including: Grim-Smith Hospital and Clinic	Kirksville	Teaching
Saint John's Mercy Hospital	Washington	Non-teaching
Southeast Missouri Hospital	Cape Girardeau	Non-teaching
Montana		
Benefis Health System	Great Falls	Non-teaching
Billings Clinic	Billings	Teaching
Kalispell Regional Hospital	Kalispell	Non-teaching
Saint Patrick Hospital and Health Sciences Center	Missoula	Non-teaching
including: Missoula General Hospital	Missoula	Non-teaching
Saint Vincent Healthcare	Billings	Teaching
Nebraska		
Alegent Health-Bergan Mercy Medical Center	Omaha	Teaching
BryanLGH Medical Center - East	Lincoln	Teaching
including: BryanLGH Medical Center - West	Lincoln	Teaching
Fremont Area Medical Center	Fremont	Non-teaching
Saint Elizabeth Regional Medical Center	Lincoln	Teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
New Jersey		
Jersey Shore University Medical Center	Neptune	Teaching
Ocean Medical Center	Brick	Non-teaching
New York		
Ellis Hospital	Schenectady	Teaching
Saint Francis Hospital - Roslyn	Roslyn	Teaching
St. Luke's Cornwall Hospital	Newburgh	Non-teaching
North Carolina		
Carolinas Medical Center - Northeast	Concord	Teaching
Halifax Regional Medical Center	Roanoke Rapids	Non-teaching
Margaret R Pardee Memorial Hospital	Hendersonville	Teaching
Mission Hospitals	Asheville	Teaching
Rex Hospital	Raleigh	Non-teaching
North Dakota		
Medcenter One	Bismarck	Teaching
Saint Alexius Medical Center	Bismarck	Teaching
Ohio		
Adena Regional Medical Center	Chillicothe	Non-teaching
Atrium Medical Center	Franklin	Non-teaching
Bethesda North Hospital	Cincinnati	Teaching
EMH Regional Medical Center	Elyria	Non-teaching
Holzer Medical Center	Gallipolis	Non-teaching
Marietta Memorial Hospital	Marietta	Non-teaching
Mercy Franciscan Hospital - Mt Airy	Cincinnati	Teaching
Mercy Hospital - Clermont	Batavia	Non-teaching
Mercy Medical Center	Canton	Teaching
Mount Carmel Health	Columbus	Teaching
Saint Elizabeth Health Center	Youngstown	Teaching
Saint John West Shore Hospital	Westlake	Teaching
St. Luke's Hospital	Maumee	Non-teaching
Salem Community Hospital	Salem	Non-teaching
The Toledo Hospital	Toledo	Teaching
Union Hospital	Dover	Non-teaching

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HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Oklahoma		
Comanche County Memorial Hospital	Lawton	Teaching
Duncan Regional Hospital	Duncan	Non-teaching
Midwest Regional Medical Center	Midwest City	Non-teaching
Saint Mary's Regional Medical Center	Enid	Non-teaching
Oregon		
Mercy Medical Center	Roseburg	Non-teaching
Rogue Valley Medical Center	Medford	Non-teaching
Sacred Heart Medical Center - University District	Eugene	Non-teaching
Saint Charles Medical Center - Bend	Bend	Teaching
Pennsylvania		
Doylestown Hospital	Doylestown	Non-teaching
Ephrata Community Hospital	Ephrata	Non-teaching
Evangelical Community Hospital	Lewisburg	Non-teaching
Geisinger South Wilkes-Barre	Wilkes Barre	Teaching
Grand View Hospital	Sellersville	Non-teaching
Hamot Medical Center	Erie	Teaching
Hazleton General Hospital	Hazleton	Non-teaching
Indiana Regional Medical Center	Indiana	Non-teaching
Lancaster General Hospital	Lancaster	Teaching
Lehigh Valley Hospital	Allentown	Teaching
Mercy Hospital - Scranton	Scranton	Teaching
Pennsylvania Hospital	Philadelphia	Teaching
Pinnacle Health System	Harrisburg	Teaching
The Medical Center - Beaver	Beaver	Teaching
The Reading Hospital and Medical Center	Reading	Teaching
Uniontown Hospital	Uniontown	Non-teaching
Williamsport Hospital & Medical Center	Williamsport	Teaching
South Carolina		
AnMed Health	Anderson	Teaching
Greenville Memorial Hospital	Greenville	Teaching
McLeod Regional Medical Center	Florence	Teaching
Sisters of Charity Providence Hospitals	Columbia	Non-teaching
Waccamaw Community Hospital	Murrells Inlet	Non-teaching

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Continued....

HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
South Dakota		
Avera McKennan Hospital and University Health Center	Sioux Falls	Teaching
Sanford USD Medical Center	Sioux Falls	Teaching
Tennessee		
Baptist Riverside Hospital	Knoxville	Non-teaching
Centennial Medical Center	Nashville	Non-teaching
Memorial Healthcare System	Chattanooga	Non-teaching
Northcrest Medical Center	Springfield	Non-teaching
Saint Thomas Hospital	Nashville	Teaching
Vanderbilt University Hospital	Nashville	Teaching
Williamson Medical Center	Franklin	Non-teaching
Texas		
Baptist St. Anthony's Health System	Amarillo	Teaching
CHRISTUS St. Michael Health System	Texarkana	Teaching
CHRISTUS Santa Rosa Hospital - New Braunfels	New Braunfels	Non-teaching
CHRISTUS Spohn Hospital Corpus Christi - Memorial	Corpus Christi	Teaching
including: CHRISTUS Spohn Hospital Corpus Christi-South	Corpus Christi	Teaching
CHRISTUS Spohn Hospital Corpus Christi-Shoreline	Corpus Christi	Teaching
Southside Health Center	Corpus Christi	Teaching
Citizens Medical Center	Victoria	Non-teaching
East Texas Medical Center - Athens	Athens	Non-teaching
Hill Country Memorial Hospital	Fredericksburg	Non-teaching
Mother Frances Hospital - Tyler	Tyler	Teaching
Providence Healthcare Network	Waco	Teaching
Saint David's Hospital	Austin	Non-teaching
San Angelo Community Medical Center	San Angelo	Non-teaching
United Regional Healthcare System	Wichita Falls	Teaching
Valley Baptist Medical Center	Harlingen	Teaching
Virginia		
Martha Jefferson Hospital	Charlottesville	Non-teaching
Winchester Medical Center	Winchester	Teaching

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Continued....

HealthGrades 2009 Patient Safety Excellence Award™ Recipients*	City	Teaching Status
Washington		
Holy Family Hospital	Spokane	Non-teaching
Northwest Hospital & Medical Center	Seattle	Non-teaching
Overlake Hospital Medical Center	Bellevue	Non-teaching
Providence Regional Medical Center - Everett	Everett	Non-teaching
Providence Saint Peter Hospital	Olympia	Teaching
Sacred Heart Medical Center	Spokane	Teaching
Saint Joseph Medical Center	Tacoma	Non-teaching
Saint Joseph's Hospital	Bellingham	Non-teaching
Tacoma General Allenmore Hospital	Tacoma	Teaching
West Virginia		
Bluefield Regional Medical Center	Bluefield	Non-teaching
Monongalia County General Hospital	Morgantown	Teaching
Wisconsin		
Aurora Baycare Medical Center	Green Bay	Non-teaching
Aurora Saint Luke's Medical Center	Milwaukee	Teaching
including: Saint Luke's Medical Center	Cudahy	Teaching
Aurora Sheboygan Memorial Medical Center	Sheboygan	Non-teaching
Bay Area Medical Center	Marinette	Non-teaching
Bellin Memorial Hospital	Green Bay	Non-teaching
Holy Family Memorial	Manitowoc	Non-teaching
including: Memorial Hospital	Manitowoc	Non-teaching
Luther Hospital Mayo Health System	Eau Claire	Teaching
Memorial Hospital - Burlington	Burlington	Non-teaching
Mercy Medical Center	Oshkosh	Non-teaching
Meriter Hospital	Madison	Teaching
Saint Joseph's Hospital	Marshfield	Teaching
Saint Mary's Hospital Medical Center	Madison	Teaching
West Allis Memorial Hospital	West Allis	Teaching
Wheaton Franciscan Healthcare - Saint Francis	Milwaukee	Teaching

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Appendix B: Patient Safety Indicators Used in this HealthGrades Study

The following 15 patient safety indicators were used in this HealthGrades study.

Patient Safety Indicator	Translated as…
Complications of anesthesia*	*excluded*
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
Accidental puncture or laceration*	*excluded*
Transfusion reaction*	*excluded*

* Complications of anesthesia, accidental puncture or laceration, and transfusion reaction were excluded from the overall performance calculation to identify the Patient Safety Excellence Award™ recipients.

Appendix C: HealthGrades Patient Safety Methodology 2009

To help consumers evaluate and compare hospital patient safety performance, HealthGrades analyzed patient data for virtually every hospital in the country to determine patient safety outcomes.

HealthGrades used Medicare inpatient data from the Medicare Provider Analysis Review (MedPAR) data file (purchased from the Centers for Medicare and Medicaid Services; 2005 through 2007 data) and Patient Safety Indicator software (QI Windows Software, version 3.2) from the Agency for Healthcare Research and Quality (AHRQ) to analyze the following 12 patient safety indicators (PSIs).

Patient Safety Indicator	Translated 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 events that are likely to occur at a hospital based on the mix of types of cases treated at that hospital. For those indicators without predicted results from the AHRQ software, predicted results were generated by grouping the 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 rating** for each patient safety indicator and an **overall patient safety rating** for a hospital.

Data Acquisition

HealthGrades uses the MedPAR data file from the Centers for Medicare and Medicaid Services (CMS) for several reasons:

- First, it includes virtually every hospital in the country, with the exception of military and Veterans Administration hospitals.

- Second, hospitals are required by law to submit complete and accurate information with substantial penalties for those that report inaccurate or incomplete data.
- Third, the Medicare population represents a majority of the adult inpatient admissions.

HealthGrades used the QI Windows Software, version 3.2, developed by the Agency for Healthcare Research and Quality (AHRQ) and downloaded from www.qualityindicators.ahrq.gov/software.htm. Two major changes were documented by AHRQ for the update to version 3.2:

- Non-surgical patients and patients with acute renal failure are no longer in the inclusion requirements for ability to diagnose and treat in time, resulting in fewer patients included and fewer events.
- In the 2009 analysis, absence of foreign body left in during procedure was not utilized as one of the indicators. Absence of foreign body left in during procedure now requires a present on admission indicator, which will not be available in MedPAR data until the 2008 data set.

Following all AHRQ guidelines for using PSI software, HealthGrades applied it to all short-term acute care hospitals in the MedPAR file for three years (2005 through 2007).

Data Exclusions

Given that the MedPAR data set applies mostly to patients over the age of 65, HealthGrades excluded the following PSIs 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.

Individual Patient Safety Indicator Rating

To determine a patient safety indicator score for each of the 12 PSIs for each hospital, HealthGrades statistically compared the **actual** rate of individual patient safety events to the **predicted** rate. HealthGrades then displays if the PSI was Best, As Expected, or Poor.

★★★★★ **Best** – Fewer patients were affected than expected.

★★★ **As Expected** – 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 reports 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.

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 performed the following steps:

1. AHRQ software calculated observed and expected rates for each hospital and PSI, provided that the PSI had at least three cases. (HealthGrades used a stratification process to calculate expected rates for those PSIs where AHRQ software only provided observed rates.)

2. HealthGrades identified significant bias in the expected rates for larger hospitals (which had consistently higher observed rates than expected). Therefore, 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.

   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 PSI for each combination of CMI group and year.

CMI Index	CMI 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

3. HealthGrades statistically compared the observed rate to the expected rate to produce a z-score for each PSI. To normalize the effect of the 12 indicators, these z-scores were rescaled to a mean of zero and standard deviation of one. The average of the 12 resulting scores determined a hospital's ranking.

4 HealthGrades divided the hospitals into two peer groups: teaching and non-teaching. 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.

5 The average of the resulting scores determined a hospital's ranking within the teaching and non-teaching groups. Star ratings were then assigned as follows:

★★★★★ Best (Top 15%)

★★★ As Expected (Middle 70%)

★ Poor (Bottom 15%)

- When a hospital is rated Best in patient safety, it means that their patient safety record is better than expected given their patient population and that they scored within the top 15 percent of hospitals that qualify for a patient safety rating.
- When a hospital is rated As Expected, their patient safety record is as expected given their patient population and they scored within the middle 70 percent of hospitals that qualify for a patient safety rating.
- When a hospital is rated Poor, their patient safety record is worse than expected and they rated within the bottom 15 percent of hospitals that qualify for a patient safety rating.
- When a hospital is not rated, it means the hospital had too few cases to be eligible to receive a patient safety rating.

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; 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.

Appendix D: Patient Safety Incidence Rates and Associated Mortality Among Medicare Beneficiaries (2005 – 2007)

Patient Safety Indicator	Year	Number of Events	Total Cases Evaluated	Rate per 1,000	Associated Mortality*	% Change in Rate (2005 – 2007)
Complications of anesthesia**	2005	674	3,471,872	0.194	6	15.14%
	2006	649	3,414,533	0.190	4	
	2007	539	3,271,930	0.165	5	
	2005-2007	1,862	10,158,335	0.183	15	
Death in low mortality DRGs	2005	3,562	1,908,678	1.866	3,562	14.63%
	2006	2,499	1,565,215	1.597	2,499	
	2007	2,449	1,537,199	1.593	2,449	
	2005-2007	8,510	5,011,092	1.698	8,510	
Decubitus ulcer	2005	149,064	4,823,206	30.906	15,030	-7.78%
	2006	147,420	4,624,060	31.881	13,979	
	2007	148,544	4,459,564	33.309	13,204	
	2005-2007	445,028	13,906,830	32.001	42,213	
Failure to rescue	2005	5,239	52,735	99.346	5,239	5.54%
	2006	4,898	51,371	95.346	4,898	
	2007	4,766	50,786	93.845	4,766	
	2005-2007	14,903	154,892	96.215	14,903	
Iatrogenic pneumothorax	2005	8,161	12,351,767	0.661	1,365	8.17%
	2006	7,542	12,007,857	0.628	1,183	
	2007	7,064	11,642,577	0.607	1,101	
	2005-2007	22,767	36,002,201	0.632	3,649	
Selected infections due to medical care	2005	19,733	8,419,293	2.344	1,844	9.55%
	2006	17,308	7,903,105	2.190	1,562	
	2007	17,516	8,262,010	2.120	1,457	
	2005-2007	54,557	24,584,408	2.219	4,863	
Post-operative hip fracture	2005	1,120	2,156,028	0.519	109	5.16%
	2006	988	2,101,100	0.470	101	
	2007	975	1,979,071	0.493	99	
	2005-2007	3,083	6,236,199	0.494	309	
Post-operative hemorrhage or hematoma	2005	9,195	3,452,351	2.663	631	2.27%
	2006	8,987	3,394,782	2.647	661	
	2007	8,465	3,252,201	2.603	495	
	2005-2007	26,647	10,099,334	2.638	1,787	
Post-operative physiologic and metabolic derangements	2005	2,352	1,826,423	1.288	478	-0.59%
	2006	2,209	1,799,895	1.227	459	
	2007	2,239	1,728,436	1.295	411	
	2005-2007	6,800	5,354,754	1.270	1,348	

Continued...

Patient Safety Indicator	Year	Number of Events	Total Cases Evaluated	Rate per 1,000	Associated Mortality*	% Change in Rate (2005 – 2007)
Post-operative respiratory failure	2005	22,888	1,347,615	16.984	5,421	-2.45%
	2006	22,619	1,324,034	17.083	5,229	
	2007	22,434	1,289,242	17.401	4,850	
	2005-2007	67,941	3,960,891	17.153	15,500	
Post-operative pulmonary embolism or deep vein thrombosis	2005	43,436	3,421,095	12.697	4,166	-14.51%
	2006	46,640	3,360,843	13.877	3,942	
	2007	46,764	3,216,572	14.538	3,661	
	2005-2007	136,840	9,998,510	13.686	11,769	
Post-operative sepsis	2005	6,829	504,510	13.536	1,862	-23.40%
	2006	6,768	463,211	14.611	1,774	
	2007	7,544	451,629	16.704	1,839	
	2005-2007	21,141	1,419,350	14.895	5,475	
Post-operative wound dehiscence in abdominopelvic surgical patients	2005	1,801	466,050	3.864	229	-2.39%
	2006	1,706	434,171	3.929	256	
	2007	1,694	428,116	3.957	219	
	2005-2007	5,201	1,328,337	3.915	704	
Accidental puncture or laceration**	2005	33,165	12,895,156	2.572	2,371	-1.20%
	2006	33,003	12,522,616	2.635	2,247	
	2007	31,613	12,145,470	2.603	2,039	
	2005-2007	97,781	37,563,242	2.603	6,657	
Transfusion reaction**	2005	75	13,105,788	0.006	3	51.99%
	2006	45	12,746,448	0.004	1	
	2007	34	12,375,267	0.003	1	
	2005-2007	154	38,227,503	0.004	5	
Totals	-	913,215	-	-	117,707	
Less Double Counts	-	864,765^	-	-	97,755	

* The mortality reported is all-cause inhospital mortality among all U.S. patients that experienced one or more patient safety events during hospitalization from 2005 through 2007.

** Complications of anesthesia, accidental puncture or laceration, and transfusion reaction were excluded from the overall performance calculation to identify the Patient Safety Excellence Award™ recipients.

^ This is the number of patients with one or more patient safety events.

Appendix E: Patient Safety Events and Their Attributable Mortality and Excess Charge Among Medicare Beneficiaries by PSI (2005 – 2007)

Patient Safety Indicator	Actual Number of National Events	Percentage of Total Number of Events	Attributable Mortality Rates**	Number of Deaths Attributable to PSI (Attributable Mortality**)	Attributable Charge**	Excess Charge Attributable to PSI** (Millions)	Excess Cost Attributable to PSI ^^ (Millions)
Decubitus ulcer	445,028	48.73%	7.23%	32,176	$10,845	$4,826.33	$2,413.16
Post-op pulmonary embolism or deep vein thrombosis	136,840	14.98%	6.56%	8,977	$21,709	$2,970.66	$1,485.33
Accidental puncture or laceration	97,781	10.71%	2.16%	2,112	$8,271	$808.75	$404.37
Post-op respiratory failure	67,941	7.44%	21.84%	14,838	$53,502	$3,634.98	$1,817.49
Selected infections due to medical care	54,557	5.97%	4.31%	2,351	$38,656	$2,108.96	$1,054.48
Post-op hemorrhage or hematoma	26,647	2.92%	3.01%	802	$21,431	$571.07	$285.54
Iatrogenic pneumothorax	22,767	2.49%	6.99%	1,591	$17,312	$394.14	$197.07
Post-op sepsis	21,141	2.32%	21.92%	4,634	$57,727	$1,220.41	$610.20
Failure to rescue*	14,903	1.63%	NA*	14,903	NA*	NA*	NA*
Death in low mortality DRGs*	8,510	0.93%	NA*	8,510	NA*	NA*	NA*
Post-op physiologic and metabolic derangements	6,800	0.74%	19.81%	1,347	$54,818	$372.76	$186.38
Post-op abdominal wound dehiscence	5,201	0.57%	9.63%	501	$40,323	$209.72	$104.86
Post-op hip fracture	3,083	0.34%	4.52%	139	$13,441	$41.44	$20.72
Complications of anesthesia	1,862	0.20%	0.00%	0	$1,598	$2.98	$1.49
Transfusion reaction	154	0.02%	0.00%	0	$18,929	$2.92	$1.46
Totals	913,215	-	-	92,882	-	$13,821.68	$6,910.84

* By definition, all patients with the event died and were excluded from Zhan and Miller's analysis on attributable mortality and cost associated with patient safety events.

** Based on previous research done by Zhan and Miller. *Excess Length of Stay, Charges, and Mortality Attributable to Medical Injuries During Hospitalization*. JAMA. 2003; 290(14):1868-1874. Insufficient data to estimate attributable mortality rates for Complications of Anesthesia and Transfusion Reaction.

^^ Assuming an average cost to charge ratio of 0.5 (Friedman, La Mare, Andrews, McKenzie, *Practical Options for Estimating Cost of Hospital Inpatient Stays*. J Health Care Finance. 2002; 29(1): 1-13.

Appendix F: Comparing Different Performance Categories (2005-2007)

	Observed-to-Expected Ratios (O/E) by PSI and Associated Outcomes					As Compared to the Top 15% Performance			
Patient Safety Indicator	ALL	Hospitals Recognized with Patient Safety Excellence Award™ O/E Ratios (95% CI)	Middle 70% O/E Ratios	Bottom 15% Hospitals O/E Ratios (95% CI)	Relative Risk Decrease Associated with Patient Safety Excellence Hospitals Compared to Bottom Hospitals	# of Excess Patient Safety Events** Among All Non-Patient Safety Award Hospitals	# Potentially Avoidable Deaths** Associated with Excess Patient Safety Events Among All Non-Patient Safety Award Hospitals	Excess Charge^ (Millions) Associated with Excess Patient Safety Events Among All Non-Patient Safety Award Hospitals	Excess Cost^^ (Millions) Associated with Excess Patient Safety Events Among All Non-Patient Safety Award Hospitals
Death in low mortality DRGs*	1.000	.713 (.673- .754)	1.019	1.231 (1.172-1.291)	42.06%	2,438	2,438	NA*	NA*
Decubitus ulcer	1.000	.703 (.697- .709)	1.003	1.287 (1.279-1.295)	45.39%	132,187	9,557	$1,434	$717
Failure to rescue*	1.000	.806 (.777- .836)	1.005	1.153 (1.119-1.186)	30.04%	2,885	2,885	NA*	NA*
Iatrogenic pneumothorax	1.000	.837 (.812- .862)	.999	1.203 (1.170-1.237)	30.47%	3,717	260	$64	$32
Selected infections due to medical care	1.000	.746 (.730- .761)	.979	1.412 (1.389-1.435)	47.18%	13,878	598	$536	$268
Post-op hip fracture	1.000	.661 (.602- .720)	1.016	1.369 (1.270-1.469)	51.74%	1,045	47	$14	$7
Post-op hemorrhage or hematoma	1.000	.817 (.795- .839)	.999	1.229 (1.199-1.260)	33.53%	4,874	147	$104	$52
Post-op physiologic and metabolic derangements	1.000	.696 (.657- .734)	.986	1.470 (1.406-1.535)	52.67%	2,067	409	$113	$57
Post-op respiratory failure	1.000	.781 (.767- .794)	.997	1.281 (1.262-1.300)	39.05%	14,891	3,252	$797	$398
Post-op pulmonary embolism or deep vein thrombosis	1.000	.809 (.799- .819)	.988	1.307 (1.293-1.321)	38.10%	26,148	1,715	$568	$284
Post-op sepsis	1.000	.718 (.695- .740)	.980	1.476 (1.438-1.513)	51.37%	5,969	1,308	$345	$172
Post-op wound dehiscence in abdominopelvic surgical patients	1.000	.693 (.644- .741)	.992	1.447 (1.367-1.528)	52.15%	1,598	154	$64	$32
Average relative risk increase in and number of potentially avoidable patient safety events, death, charge and cost associated with All Non-Patient Safety Award hospitals compared to Patient Safety Excellence Award™ hospitals.					42.81%	211,697	22,771	$4,040	$2,020

* By definition, all patients with the event died and were excluded from Zhan and Miller's analysis on attributable mortality and cost associated with patient safety events.

** Excess events are determined by applying the Patient Safety Excellence Hospital event rates to all other hospitals and subtracting from their actual event rate.

^ Based on previous research done by Zhan and Miller . *Excess Length of Stay, Charges, and Mortality Attributable to Medical Injuries During Hospitalization*. JAMA. 2003; 290(14):1868-1874.

^^ Assuming an average cost to charge ratio of 0.5 (Friedman, La Mare, Andrews, and McKenzie. *Practical Options for Estimating Cost of Hospital Inpatient Stays*. J Health Care Finance. 2002; 29(1): 1-13).

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Health Grades Inc. is the leading independent healthcare ratings organization, providing quality ratings, profiles and cost information on the nation's hospitals, physicians, nursing homes and prescription drugs.

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