HealthGrades Quality Study

Second Annual Patient Safety in American Hospitals Report

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HEALTHGRADES®
THE HEALTHCARE QUALITY EXPERTS®

Second Annual
Patient Safety in American Hospitals Report
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In this report, HealthGrades identifies the patient safety incident rates for nearly every hospital in the country by applying AHRQ's Patient Safety Indicator methodology[1] to three years of Medicare data (2001-2003). From this analysis, HealthGrades identifies the best-performing hospitals to establish a best-practice benchmark against which other hospitals can be evaluated. See Appendix A for list of best-performing hospitals. This study also identifies trends in important patient safety issues among the nation's hospitals.

Introduction

Five years after the Institute of Medicine (IOM) first released its report on medical errors, the healthcare industry has moved from denying the scope of its problems with medical errors to accepting the importance and inevitability of transparency, of educating boards, senior leaders and staff about errors and their consequences, and of investing in safety improvements. This new acceptance has resulted in a proliferation of patient safety improvement projects with widespread participation. To date, however, efforts have not achieved the report's goal of reducing medical errors by 50 percent within five years.

Based on the IOM estimates, the United States loses more American lives to patient safety incidents every six months than it did in the entire Vietnam War. This also equates to three fully loaded jumbo jets crashing every other day for the last five years.[2] If medical errors were recognized by the Centers for Disease Control & Prevention (CDC) in its annual National Vital Statistics Report,[3] they would be ranked as the sixth leading cause of death in the United States. According to the report, deaths due to medical errors would outrank deaths due to diabetes, influenza and pneumonia, Alzheimer's disease and renal disease.

Cohesive National Agenda Still Needed

During the last five years, 20 states that currently have some form of medical error reporting law have paved the way for a national effort to collect and analyze medical errors data to help providers learn and improve. Nonetheless, this country is still without a cohesive national agenda, resulting in a myriad of highly variable patient safety efforts that are largely local.

Public Perception Has Improved

Efforts and improvements that have occurred during the last five years have had a positive impact on public perception about medical errors. For example, in a recent survey during 2004 of about 2,000 adults by the Kaiser Family Foundation,[4] 34 percent said they or a family member had experienced a preventable medical error. This is a 20 percent improvement from the 42 percent found in their 2002 survey of about 1,000 adults.

Patient Safety Adverse Events have Increased

Despite improved public perception, the March 2005 MedPAC Report to the Congress on Medicare Payment Policy found that not only are hundreds of thousands of Medicare beneficiaries experiencing adverse events every year, they are doing so at increasing rates. Although overall Medicare mortality has been steadily declining, MedPAC determined that a majority of patient-safety adverse events in Medicare beneficiaries increased from 1995 to 2003.[5]

Pursuing Patient Safety Improvements

Americans are not alone in the pursuit of patient safety improvement, as both developed and developing countries also struggle with the problem. Studies in a number of countries have shown a rate of adverse events of 3.5 percent to 16.6 percent among hospitalized patients. Because of this global problem, the World Alliance for Patient Safety was launched on October 30, 2004. Led by World Health Organization (WHO), academia, senior health officials and patients' groups, the Alliance's mission is to advance the patient safety goal of "first do no harm" and to reduce the adverse health and social consequences in the provision of health care.

Measuring Patient Safety

These global estimates likely represent only the tip of the medical-errors-iceberg. A major reason for this is that there has been a lack of effective measurement tools to help providers measure and reduce medical errors to improve patient safety. In response to the increased need for patient safety measurements, the Agency for Healthcare Research and Quality (AHRQ) recently developed and released a set of Patient Safety Indicators (PSIs), which are specifically designed for screening administrative data for incidences of concern related to patient safety.[1] AHRQ is the lead agency for the U.S. government on quality in health care, sponsoring research that examines the frequency and cause of medical errors and testing techniques designed to reduce these mistakes. (For a complete list of the AHRQ Patient Safety Indicators (PSIs) used in this study, see Appendix B.)

Using this measurement tool, AHRQ was the first to identify the rates of, and excess length of stay and mortality associated with, these specific patient safety indicators. Extrapolating from AHRQ's sample data, representing approximately 20 percent of all U.S. hospitals (2000 Healthcare Cost and Utilization Project Nationwide Inpatient Sample), researchers estimated that the 18 patient safety indicators evaluated contributed to $9.3 billion excess charges and 32,591 deaths in the United States annually.[6]

Continued Healthcare Epidemic

In last year's *Patient Safety in American Hospitals Report*, HealthGrades found that for every Medicare patient that developed one or more patient safety incidents, he or she had a one-in-four chance of dying. With more than 1,000,000 incidents associated with $8.5 billion of excess cost identified among this same data set of hospitalized Medicare beneficiaries from 2000-2002,[7] and with a benchmark of "one preventable medical error is one too many," one can easily conclude that medical errors continues to be a major healthcare epidemic.

Given this serious epidemic and further economic burden on our already strained healthcare system, providers and others must develop systems to reduce medical errors, and consumers and purchasers must be armed with information that allows them to make quality-oriented healthcare choices when choosing a hospital. To identify the patient safety incident rates for every hospital in the country, HealthGrades applied AHRQ's Patient Safety Indicator methodology[1] to three years of Medicare data (2001-2003).

Summary of Findings

AHRQ's development of the Patient Safety Indicators (PSIs) was based on the IOM's definition of *patient safety*: "***freedom from accidental injury due to medical care, or medical errors***." [8] *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.*" [9]

In 2002, AHRQ, in collaboration with the University of California-Stanford Evidence-Based Practice Center, identified 20 indicators for potentially preventable patient safety incidents 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.[1]

HealthGrades used AHRQ's *PSI Version 2.1, Revision 3a February 2005* software application[1] and research by Zhan and Miller,[6] to study the safety and associated excess cost of inpatient hospital care based on 16 of the total 20 patient safety indicators (excluding four PSIs related to obstetrics) among Medicare beneficiaries in the U.S. from 2001 to 2003. The 16 PSIs we studied are listed in Appendix B. In addition, using the rates calculated for 13 of the 16 PSIs studied, we also calculated an overall patient safety score for each hospital to identify the best overall performing hospitals. (See Appendix A and C.)

In our study, we found:

- Approximately **1.18 million total patient safety incidents** occurred among the nearly 39 million hospitalizations in the Medicare population during 2001 through 2003.
- The rates of six key quality improvement focus areas (metabolic derangements, post-operative respiratory failure, decubitus ulcer, post-operative pulmonary embolus (PE) or deep vein thrombosis (DVT), and hospital-acquired infections) **worsened** on average by 20 percent or more over four years (2000 through 2003), while another six PSIs (death in low mortality DRGs, failure to rescue, iatrogenic pneumothorax, post-operative hip fracture, post-operative hemorrhage or hematoma, and post-operative wound dehiscence) **improved** on average by less than 10 percent.
- The **PSIs with the highest incidence rates** were failure to rescue, decubitus ulcer, and post-operative sepsis. These three patient safety incidents accounted for 62 percent of all patient safety incidents among Medicare patients hospitalized in 2001 through 2003.
- Of the total of 298,865 deaths among patients who developed one or more PSIs during 2001 through 2003, **81 percent** (n=241,280) of these **deaths** were **attributable to the patient safety incidents**.
- After excluding deaths related to failure to rescue and death in low mortality DRGs, three PSIs, **decubitus ulcer, post-operative PE/DVT**, and **post-operative respiratory failure**, accounted for 75% of the potentially preventable PSI-related deaths. Hospitalized Medicare beneficiaries who developed one or more PSI incidents still experienced, on average, a 10 percent associated mortality rate, excluding failure to rescue and death in low mortality DRGs. This rate significantly increased as the number of incidents per patient increased.
- Hospital-acquired infections correlated most highly with overall performance and performance on the other 12 PSIs, suggesting that hospital-acquired infection rates could be possibly used as a proxy of overall hospital patient safety.
- **Hospital-acquired infections rates worsened** by approximately 20 percent from 2000 to 2003 and accounted for 9,552 deaths and $2.60 billion, almost 30 percent of the total excess cost related to the patient safety incidents.

- There were wide, highly significant gaps in individual PSI and overall performance between the top 10% and the bottom 10% ranked hospitals.
  - Top 10% hospitals generally had lower incident rates across all PSIs in 2001, but also generally improved at a greater rate than the bottom 10% hospitals between 2001 and 2003.
  - Overall, from 2001 through 2003, the best-performing hospitals as a group (hospitals that had the lowest overall PSI incident rates of all hospitals studied, defined as **the top 10%** of all hospitals studied) had **267,151 fewer patient safety incidents and 48,417 fewer deaths** resulting in a **lower cost of $2.3 billion** associated with Medicare beneficiaries as compared to the bottom 10% of all hospitals studied.
  - Patients in the **top 10% hospitals** had, on average, an almost **50 percent lower occurrence** of experiencing one or more PSIs compared to patients at the bottom 10% hospitals. Important and frequent contributors to this notable difference were **significantly lower rates of hospital-acquired infections** and post-operative metabolic derangements.
  - If the bottom 10% hospitals improved only their hospital-acquired infection rates to the level of top 10% hospitals, 2,734 deaths associated with $792 million could have been avoided from 2001 through 2003.
- The **16 PSIs** studied accounted for **$8.73 billion in excess inpatient cost** to the Medicare system over the three years studied, or roughly **$2.91 billion annually**. The following three PSIs were the most costly and accounted for 67 percent of all excess attributable costs from 2001 through 2003:
  - Decubitus ulcer ($2.77 billion)
  - Selected infections due to medical care ($1.90 billion)
  - Post-operative pulmonary embolism (PE) or deep vein thrombosis (DVT) ($1.21 billion).

Methodology

In order to evaluate *overall* hospital performance and to identify the best performing hospitals across the U.S., we used AHRQ's *Patient Safety Indicator Version 2.1, Revision 3a February 2005* software application[1] to evaluate every hospital in the country on 16 PSIs, and then developed a ranking methodology to evaluate overall patient safety performance for each hospital. To minimize potential impact of variations in hospital coding of specific E codes when assessing overall hospital performance, we followed the recommendation of AHRQ[10] to exclude three PSIs (complications of anesthesia, accidental puncture or laceration, transfusion reaction) that included these specific E codes in their numerator definition. (See Appendix C.)

Charge, cost and mortality attributable to patient safety incidents were calculated using attributable charge and mortality data from previous PSI research by Zhan and Miller[6] and an assumption that cost is 50 percent of the charge.[11]

Findings

Using the *Patient Safety Indicator Version 2.1, Revision 3a April 2005* software application developed by AHRQ,[1] HealthGrades identified a total of 1.18 million patient safety incidents that occurred in approximately 39 million hospitalizations in the Medicare population from 2001 through 2003. The 16 PSIs studied accounted for approximately $8.73 billion during 2001 through 2003, or $2.91 billion annually.

The following PSIs were the most costly and accounted for 67 percent of all excess attributable costs from 2001 through 2003. (See Appendix D.)

- Decubitus ulcer ($2.77 billion)
- Selected infections due to medical care ($1.90 billion)
- Post-operative pulmonary embolism (PE) or deep vein thrombosis (DVT) ($1.21 billion)

The most commonly occurring PSIs are noted in Table 1 below. These three PSIs accounted for almost 62 percent of all patient safety incidents from 2001 through 2003.

Table 1: Most Commonly Occurring Patient Safety Incidents Per 1000 At-risk Hospitalizations

Patient Safety Indicator	Incident Rate per 1000 At-risk Hospitalizations
Failure to rescue	148
Decubitus ulcer	31
Post-operative sepsis	14

The rates of patient safety incidents that we identified were very similar to our previous study and those of others.[5,6,7,12,13,14] Decubitus ulcer alone accounted for $2.77 billion in, and 32 percent of, the total avoidable cost associated with the 16 PSIs. For the incident rates of all 16 PSIs, see Appendix E. For the excess mortality and cost attributable to each PSI, see Appendix D.

We determined that from 2001 to 2003, the rates of six key PSIs that are and have been national quality improvement focus areas (metabolic derangements, post-operative respiratory failure, decubitus ulcer, post-operative PE/DVT, and hospital-acquired infections) **worsened** on average by 20 percent, while another six PSIs (death in low mortality DRGs, failure to rescue, iatrogenic pneumothorax, post-operative hip fracture, post-operative hemorrhage or hematoma, post-operative wound dehiscence) **improved** at an average rate of approximately 10 percent. (See Appendix E.)

Although mortality attributable to medical errors and injury is relatively rare and overall mortality rates among Medicare beneficiaries have been declining steadily, we determined that the 16 PSIs studied may still have contributed to 241,280 deaths from 2001 through 2003. This translates to an approximate 20 percent overall mortality rate in Medicare patients potentially attributable to patient safety incidents. More simply stated, one in every five Medicare patients who were hospitalized from 2001 to 2003, and experienced a patient safety incident, died compared to only 0.18 of every five (3.57%) Medicare patients who did not experience a patient safety incident.

Excluding failure to rescue and death in low mortality DRGs, the patient safety incidents associated with the highest number of potentially preventable deaths were decubitus ulcer (36,972), post-operative PE/DVT (7,317), and post-operative respiratory failure (6,258). These deaths accounted for 75% of all the potentially preventable deaths, excluding the two death indicators. Despite excluding the two death indicators, there was still a notable 10 percent associated mortality rate among patients who experienced at least one patient safety incident compared to only a 3.57 percent mortality rate among patients who did not experience an incident. Also, we found that as the number of patient safety incidents per patient increased, so did the associated mortality rate. (See Appendix F.)

Although we found relatively small variations in patient safety incident rates across most regions, there were marked differences in individual PSI and overall patient safety performance among hospitals. 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 10% of hospitals based on overall hospital performance. (See Appendix A and C.) More specifically, we found that the top 10% hospitals, as a group, significantly outperformed the bottom 10% hospitals on every PSI and also on overall patient safety performance, equating to, on average, a 50 percent lower occurrence, or half the occurrence rate, of developing one or more patient safety incidents compared to the bottom 10% hospitals. (See Appendix G.)

Not only did the top 10% hospitals generally have lower incident rates across all PSIs in 2001, but they also generally improved at a greater rate for PSI incident and mortality rates than the bottom 10% hospitals from 2001 to 2003. (See Appendix H and I.) This overall better performance and improvement by the top 10% hospitals can be extrapolated to 267,151 fewer patient safety incidents, 48,417 fewer associated deaths, and $2.3 billion lower cost from 2001 through 2003. (See Appendix G.)

In addition, 35 percent of this extra cost, or $792 million, associated with the bottom 10% overall performance resulted from hospital-acquired infections (selected infections due to medical care, and post-operative sepsis). Notably, these two infection PSIs had the greatest statistically significant correlation to overall patient safety performance (Pearson's Correlation 0.540, 0.501 respectively). (See Appendix J.)

Interpretation of Results

This is our second study evaluating the potentially avoidable patient safety incidents and associated mortality and cost using AHRQ's PSIs[1] across all U.S. hospitals among the most vulnerable patient population—Medicare patients over the age of 65. This study identified that overall mortality among hospitalized Medicare beneficiaries has been declining since 2001. However, five years after the IOM set a goal to reduce the medical error rate in the U.S. by 50 percent, we found that Medicare patients continue to suffer from increasing medical errors and injuries.

When comparing risk-adjusted performance (Observed to Expected (O/E) ratio), the top 10% hospitals significantly outperformed the bottom 10% hospitals across all PSIs. Although observed rates for hospital-acquired infections (selected infections due to medical care and post-operative sepsis) worsened since 2001, rates associated with the top 10% hospitals were half the rate of the bottom 10% hospitals.

The CDC's National Nosocomial Infections Surveillance (NNIS) system has identified hospital acquired infections as a major problem in American hospitals. They have been tracking this rate among participating hospitals since 1990. NNIS participants were able to decrease bloodstream and wound infections rates by 30 and 60 percent, respectively since 1990.[15] With more than two million patients afflicted with hospital-acquired infections every year, sharing these best practices with non-participating hospitals and adopting the process improvement and protocols implemented by these participating hospitals would have an enormous impact. Our study determined that if the bottom 10% hospitals only improved their hospital-

acquired infection rates to the level of the top 10% hospitals, 2,734 deaths associated with $792 million could have been avoided. Although these infections accounted for almost 15 percent of all the excess patient safety incidents from 2001 through 2003, they accounted for an impressive 34 percent of the total excess cost difference between the top 10% and the bottom 10% hospitals.

It is likely that hospitals that have been measuring and improving their hospital-acquired infection rates also have been measuring and improving other adverse outcomes associated with hospital care. We found, in the aggregate, the better the performance on hospital-acquired infections, the better the hospital performed across all PSIs and overall patient safety. We hypothesize that hospital-acquired infection rates could be a proxy indicator of overall hospital safety and that consumers, purchasers and providers can quickly screen for the *state of patient safety* in hospitals by evaluating their infection rates compared to the top 10% hospitals' rates.

If American hospitals were to implement what we know works, many costly complications could be avoided and lives would be saved. For example, we know that washing hands before patient contact is a simple and effective process that is proven to reduce hospital-acquired infection rates. However, in a recent study[16], 57 percent of physicians do not wash their hands after patient contact and 67 percent of those that did not thought it was "too difficult." This is a perfect illustration that many institutions already know where their problems are, but fixing them is the real challenge as it is often dependent on individual behavior and attitude change.

The Institute for Healthcare Improvement (IHI) is a change agent for health care. IHI has recently launched its 100K Lives Campaign which has already signed up more than 1,000 hospitals, such as the Department of Veterans Affairs and HCA. The campaign's goal is to reduce the number of preventable deaths by 100,000 over the course of 18 months, ending in June 2006, and maintain this progress each year thereafter. The hospitals participating would accomplish this by implementing six What We Know Works process and systems improvements. These include:

- Developing and deploying rapid response teams at the first sign of patient decline
- Delivering evidence-based care for patients with acute myocardial infarction
- Implementing medication reconciliation
- Using evidence-based methods to prevent central line infections
- Using evidence-based methods to prevent ventilator-acquired pneumonia
- Using evidence-based methods to prevent surgical site infections.

National campaigns, like the IHI's 100K Lives Campaign, will no doubt improve patient safety among its hospital participants. However, its participants only represent less than 20 percent of all acute-care hospitals. We anticipate that the performance gap between the top 10% and the bottom 10% hospitals will continue to widen without appropriate incentives.

Financial incentives to reduce errors—one of the few levers that virtually everyone agrees would speed up progress on safety—are currently non-existent. Organizations that have invested in technology, training and the right people to reduce errors and improve patient safety are not reaping direct financial benefits from having done so. This may soon change with the rise of pay-for-performance programs.

Due to the anticipated impact of pay-for-performance incentives and national campaigns like the IHI's, healthcare stakeholders and patient safety experts are cautiously optimistic about making progress during the next five years. Over this time period, it is anticipated that an influx of new clinicians and healthcare executives who will be trained in and prepared for the new era of quality and patient safety accountability,

and the public's growing awareness of and demand for improvements in patient safety, will energize the industry and facilitate more rapid change.

In conclusion, our results illustrate and validate previous studies that, although the United States provides some of the best health care in the world, the number of errors associated with this care continues to be at unacceptably high levels. Not only are they unacceptably high, but they are increasing among Medicare beneficiaries and are also associated with significant negative economic consequences. We support national organizations like Institute for Healthcare Improvement and the Agency for Healthcare Research and Quality for providing the research and tools to help providers implement best practices and improve. We wait with much anticipation to see if health care reduces its number of medical errors by 50 percent 10 years after the recommendation by IOM. If providers can implement what they already know works and be rewarded for it, we believe this goal is achievable.

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Appendix A: List of Best-Performing Hospitals for Overall Patient Safety

The following is a list hospitals who are recipients of this year's HealthGrades Distinguished Hospital Award for Patient Safety™.

Hospital	City	State
Abbott Northwestern Hospital Inc	Minneapolis	MN
Allen Memorial Hospital	Waterloo	IA
Battle Creek Health System	Battle Creek	MI
Baxter Regional Medical Center	Mountain Home	AR
Bay Area Medical Center	Marinette	WI
Blake Medical Center	Bradenton	FL
Blanchard Valley Regional Health Center	Findlay	OH
Boone Hospital Center	Columbia	MO
Botsford General Hospital	Farmington	MI
Cape Canaveral Hospital	Cocoa Beach	FL
Cape Cod Hospital	Hyannis	MA
Charleston Area Medical Center	Charleston	WV
Christ Hospital	Cincinnati	OH
Columbia Hospital	Milwaukee	WI
Community Hospital of The Monterey Peninsula	Monterey	CA
Community Medical Center	Toms River	NJ
Danbury Hospital	Danbury	CT
Deaconess Hospital	Cincinnati	OH
Deaconess Hospital Inc	Evansville	IN
Decatur Memorial Hospital	Decatur	IL
Doctors Hospital of Sarasota	Sarasota	FL
E M H Regional Medical Center	Elyria	OH
Elkhart General Hospital	Elkhart	IN
Enloe Medical Center	Chico	CA
Evangelical Community Hospital	Lewisburg	PA
Evanston Northwestern Healthcare	Evanston	IL
Firsthealth Moore Regional Hospital	Pinehurst	NC
Florida Hospital	Orlando	FL
Flowers Hospital	Dothan	AL

Hospital	City	State
Glendale Adventist Medical Center	Glendale	CA
Good Samaritan Hospital	West Islip	NY
Good Samaritan Hospital	Lebanon	PA
Good Samaritan Hospital and Rehabilitation Center	Puyallup	WA
Good Samaritan Regional Health Center	Mount Vernon	IL
Grant Medical Center	Columbus	OH
Great River Medical Center	West Burlingt	IA
Gulf Coast Medical Center	Panama City	FL
Hackley Hospital	Muskegon	MI
Hamot Medical Center	Erie	PA
Harris Methodist Fort Worth	Fort Worth	TX
Healtheast St John's Hospital	Maplewood	MN
HealthEast St Joseph's Hospital	Saint Paul	MN
Heartland Regional Medical Center	Saint Joseph	MO
Helen Keller Hospital	Sheffield	AL
Holmes Regional Medical Center/Palm Bay Community Hospital	Melbourne	FL
Hospital of St Raphael	New Haven	CT
Iowa Methodist Medical Center	Des Moines	IA
JFK Medical Center	Atlantis	FL
John D Archbold Memorial Hospital	Thomasville	GA
John T Mather Memorial Hospital	Port Jefferso	NY
Lancaster General Hospital	Lancaster	PA
Lee Memorial Hospital	Fort Myers	FL
Main Line Hospital Bryn Mawr Campus	Bryn Mawr	PA
Marymount Hospital	Garfield Heig	OH
Mayo Clinic Hospital	Phoenix	AZ
Mclaren Regional Medical Center	Flint	MI
Memorial Hospital	Chattanooga	TN
Mercy General Hospital	Sacramento	CA
Mercy Hospital	Scranton	PA
Mercy Medical Center Dubuque	Dubuque	IA
Mercy Medical Center North Iowa	Mason City	IA
Mercy Medical Center of Oshkosh Inc	Oshkosh	WI

Hospital	City	State
Mercy Medical Center of Springfield	Springfield	OH
Mercy Medical Center Sioux City	Sioux City	IA
Mercy Memorial Health Center	Ardmore	OK
Methodist Hospitals Inc Southlake	Merrillville	IN
Metropolitian Hospital	Grand Rapids	MI
Midmichigan Medical Center- Midland	Midland	MI
Mission St. Joseph's Health System – Mission Campus	Asheville	NC
Morton Plant Hospital	Clearwater	FL
Munroe Regional Medical Center	Ocala	FL
Naples Community Hospital Inc	Naples	FL
Northwest Medical Center	Tucson	AZ
Northwest Medical Center UPMC	Franklin	PA
Oakwood Hospital and Medical Center	Dearborn	MI
O'Connor Hospital	San Jose	CA
Opelousas General Hospital System	Opelousas	LA
Palos Community Hospital	Palos Heights	IL
Parma Community General Hospital	Parma	OH
Poudre Valley Hospital	Fort Collins	CO
Presbyterian Hospital of Dallas	Dallas	TX
Regional Medical Center Bayonet Point	Hudson	FL
Reid Hospital and Health Care Services	Richmond	IN
Resurrection Medical Center	Chicago	IL
Rio Grande Regional Hospital	Mc Allen	TX
Riverside Methodist Hospital	Columbus	OH
Rogue Valley Medical Center	Medford	OR
Sacred Heart Hospital	Cumberland	MD
Sacred Heart Medical Center	Spokane	WA
Saint Josephs Hospital	Atlanta	GA
Saint Lukes Hospital of Kansas City	Kansas City	MO
Salina Regional Health Center	Salina	KS
Salinas Valley Memorial Hospital	Salinas	CA
Sarasota Memorial Hospital	Sarasota	FL
Scott and White Memorial Hospital	Temple	TX
Scripps Green Hospital	La Jolla	CA

Hospital	City	State
Scripps Memorial Hospital La Jolla	La Jolla	CA
Southwest General Health Center	Middleburg He	OH
St Agnes Hospital	Fond Du Lac	WI
St Alexius Medical Center	Bismarck	ND
St Charles Mercy Hospital	Oregon	OH
St Clair Memorial Hospital	Pittsburgh	PA
St Davids Hospital	Austin	TX
St Elizabeth Medical Center	Covington	KY
St Francis Medical Center	Monroe	LA
St Helena Hospital	Deer Park	CA
St Johns Hospital	Springfield	IL
St Joseph Health Center	Saint Charles	MO
St Joseph Hospital Port Charlotte	Port Charlott	FL
St Josephs Hospital	Saint Paul	MN
St Lukes Hospital	Jacksonville	FL
St Lukes Hospital Of Duluth	Duluth	MN
St Lukes Medical Center	Milwaukee	WI
St Lukes Regional Medical Center	Boise	ID
St Mary Medical Center Inc	Hobart	IN
St Mary Mercy Hospital	Livonia	MI
St Marys Health Center	Jefferson Cit	MO
St Marys Medical Center	Duluth	MN
St Patrick Hospital Corporation	Missoula	MT
St Peters Hospital	Albany	NY
St Thomas Hospital	Nashville	TN
St Vincent Hospital and Health Services	Indianapolis	IN
St Vincent Medical Center	Los Angeles	CA
Texoma Medical Center	Denison	TX
Thibodaux Regional Medical Center	Thibodaux	LA
Toledo Hospital	Toledo	OH
UCLA Medical Center	Los Angeles	CA
United Hospitals Inc	Saint Paul	MN
United Regional Health Care System	Wichita Falls	TX
University Hospital	Augusta	GA

Hospital	City	State
UPMC St Margaret	Pittsburgh	PA
Verde Valley Medical Center	Cottonwood	AZ
Virginia Baptist Hospital And Lynchburg General	Lynchburg	VA
Willis-Knighton Medical Center	Shreveport	LA
Yavapai Regional Medical Center	Prescott	AZ
York Hospital	York	PA

Appendix B: List of Patient Safety Indicators Used in HealthGrades Study

- Accidental puncture or laceration
- Complications of anesthesia
- Death in low mortality DRGs
- Decubitus ulcer
- Failure to rescue
- Foreign body left in during procedure
- Iatrogenic pneumothorax
- Selected infections due to medical care
- Post-operative hemorrhage or hematoma
- Post-operative hip fracture
- Post-operative physiologic and metabolic derangement
- Post-operative pulmonary embolism or deep vein thrombosis
- Post-operative respiratory failure
- Post-operative sepsis
- Post-operative abdominal wound dehiscence
- Transfusion reaction

Appendix C: Overall Patient Safety Indicator Hospital Performance Assessment Methodology (2001 – 2003 MedPAR Data)

Patient Safety Measurement

This methodology includes the following Patient Safety Indicators:

- Death in low mortality Diagnostic Related Groupings (DRGs)
- Decubitus ulcer
- Failure to rescue
- Foreign body left in during procedure
- Iatrogenic pneumothorax
- Selected infections due to medical care
- Post-operative hip fracture
- Post-operative hemorrhage or hematoma
- 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

Data Acquisition

HealthGrades used the CMS MedPAR data 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 Version 2.1, Revision 3a, of the Patient Safety Indicator (PSI) software developed by the Agency for Healthcare Research and Quality (AHRQ) and downloaded from www.qualityindicators.ahrq.gov/data/hcup/psi.htm.

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 (2001-2003).

Given that this 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

Based on AHRQ's recommendation, HealthGrades excluded three additional indicators:

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

Data Exclusions

Because of a recent DRG reclassification by CMS, HealthGrades made one modification to the 2003 data. Because ICD-9 diagnosis code 436—acute but ill-defined cerebrovascular disease—was recently reclassified from DRG 14 to DRG 15, this relatively high mortality patient group was included in AHRQ's PSI "Low Mortality DRG" denominator in Version 2.1, Revision 3a. In order to be consistent with AHRQ's definition of "Low Mortality DRG" (which is a DRG with an average inhospital mortality rate less than 0.5% nationally), HealthGrades excluded patients with ICD-9 436 from this PSI.

HealthGrades also removed hospitals in the U.S. territories and Puerto Rico from the data set.

Overall Patient Safety Score

To determine the overall patient safety score by hospital, HealthGrades performed the following steps.

1. AHRQ software calculated observed, expected, risk-adjusted and smoothed rates for each hospital and PSI, provided that the PSI had at least three cases.

2. HealthGrades identified significant bias in the expected rates for larger hospitals (which had consistently higher than observed rates). Therefore, HealthGrades performed further risk adjustment using the Medicare Case Mix Index (CMI). The case mix index adjustment adjusts 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:

a) Stratified hospitals by their CMI category. This was done separately for each of the three years (2001-2003) using the corresponding year's CMI. Therefore, it is possible that a hospital could be in different CMI strata from year to year. (See Table 1 for definitions. CMI < 1.25 was the first level, and so on.)

b) Adjusted the expected (predicted) counts so that the total observed count was equal to the total expected for each PSI, and for each year-CMI level combination. (For example, if CMI level 1 had 2,000 predicted events and 1,800 observed for a given year and PSI, each of the hospitals in this group would have its predicted value reduced by 10 percent. If the CMI level 6 had 3,000 predicted and 4,000 observed, those hospitals would have the predicted values increased by 33 percent.)

3. HealthGrades statistically compared the observed rate to the expected rate to produce a z-score for each PSI that had sufficient volume at any hospital. To normalize the effect of the 13 indicators, these z-scores were rescaled to a mean of zero and standard deviation of one. The average of the 13 resulting scores determined a hospital's ranking.

4. HealthGrades divided the hospitals in to two peer groups: teaching and non-teaching. To identify the teaching peer group, HealthGrades used the Medicare Cost Report (Form CMS-2552-96). A facility was considered a teaching hospital if they answered "yes" to the question "Is this a teaching hospital or

affiliated with a teaching hospital?" Hospitals that received substantial Indirect Medical Education payments in 2003 were also classified as teaching hospitals.

5. To be ranked on overall patient safety performance assessment, hospitals had to be rated in at least 20 of 28 HealthGrades cohorts and have a current overall HealthGrades star rating of at least 2.5. The final data set included 713 teaching hospitals and 643 non-teaching hospitals.

6. HealthGrades identified both teaching and non-teaching hospitals in the top 10 percent as "best-performing." These 135 hospitals represent three percent of the total hospitals evaluated.

	Number of Best Performing Providers
Teaching Hospitals	71
Non-Teaching Hospitals	64

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 report, therefore, "hospital" refers to one hospital or a group of hospitals reporting under a single provider ID.

Hospitals were assigned one of seven levels for case mix index. Hospitals were categorized according to their 2003 index as follows.

Table 1. CMI Index

CMI Index	CMI Group	# of "Best Performing" Hospitals
0.00 < CMI < 1.25	1	9
1.25 < CMI < 1.35	2	22
1.35 < CMI < 1.45	3	21
1.45 < CMI < 1.55	4	23
1.55 < CMI < 1.65	5	20
1.65 < CMI < 1.75	6	13
CMI > 1.75	7	27

Appendix D: Patient Safety Incidents, Attributable Mortality & Excess Charge

Patient Safety Indicator	Actual Number of National Incidents	Percentage of Total Number of Incidents	All-cause National Medicare Mortality Rate	Attributable Mortality Rates**	Total Number of National Deaths (all cause) in At- risk Patients by PSI	Number of Deaths Attributable to a PSI (Attributable Mortality**)	Attributable Charge **	Excess Charge Attributable to a PSI** In Millions	Excess Cost Attributable to a PSI^^ In Millions
Decubitus ulcer	511,370	43.44%	12.77%	7.23%	65,306	36,972	$10,845	$5,545.81	$2,772.90
Failure to rescue*	198,793	16.89%	100.00%	NA*	198,793	198,793	NA*	NA*	NA*
Post-op pulmonary embolism or deep vein thrombosis	111,543	9.47%	11.79%	6.56%	13,147	7,317	$21,709	$2,421.49	$1,210.74
Accidental puncture or laceration	115,021	9.77%	7.42%	2.16%	8,538	2,484	$8,271	$951.34	$475.67
Selected infections due to medical care	98,090	8.33%	12.85%	4.31%	12,605	4,228	$38,656	$3,791.77	$1,895.88
Iatrogenic pneumothorax	33,632	2.86%	17.85%	6.99%	6,003	2,351	$17,312	$582.24	$291.12
Post-op respiratory failure	28,656	2.43%	29.32%	21.84%	8,402	6,258	$53,502	$1,533.15	$766.58
Post-op hemorrhage or hematoma	23,185	1.97%	6.10%	3.01%	1,415	698	$21,431	$496.88	$248.44
Post-op hip fracture	3,632	0.31%	11.95%	4.52%	434	164	$13,441	$48.82	$24.41
Post-op sepsis	24,290	2.06%	28.25%	21.92%	6,861	5,324	$57,727	$1,402.19	$701.09
Death in low mortality DRGs*	10,410	0.88%	100.00%	NA*	10,410	10,358	NA*	NA*	NA*
Post-op physiologic and metabolic derangements	7,084	0.60%	22.08%	19.81%	1,564	1,403	$54,818	$388.33	$194.17
Post-op abdominal wound dehiscence	6,357	0.54%	14.93%	9.63%	949	612	$40,323	$256.33	$128.17
Foreign body left in during procedure	2,644	0.22%	5.26%	2.14%	139	57	$13,315	$35.20	$17.60
Complications of anesthesia	2,342	0.20%	1.32%	0.00%	31	0	$1,598	$3.74	$1.87
Transfusion reaction	195	0.02%	8.72%	4.31%	17.00	8	$38,656	$7.54	$3.77
Totals	**1,177,244**	-	-	-	**334,614**	**277,029**	-	**$17,464.82**	**$8,732.41**
Less Double Counts	**35,749**	-	-	-	**298,865**	**241,280**	-	-	-

* By definition, all patients with the event died and were excluded from Zahn and Miller's analysis on attributable mortality and cost associated with PSI incidents. Also, 0.5% of total deaths associated with Death in Low Mortality DRGs were subtracted from the Number of Deaths Attributable to this PSI.

**Based on previous research done by Zhan C and Miller MR. 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 B. La Mare J, Andrews R, McKenzie D. Practical options for estimating cost of hospital inpatient stays. J Health Care Finance. 2002; 29(1): 1-13.

Appendix E: Patient Safety Incidents & Rates of Change

Patient Safety Incidents & Rates that Did Not Change Over Time						
Incident	**2000**	**2001**	**2002**	**2003**	**2001 - 2003**	**Change (2000 to 2003)**
Complications of anesthesia	0.02%	0.02%	0.03%	0.02%	0.02%	0.00%
Accidental operative laceration	0.29%	0.29%	0.31%	0.29%	0.30%	0.00%
Foreign body left in during procedure	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
Transfusion reaction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Patient Safety Incidents & Rates that Improved Over Time						
Incident	**2000**	**2001**	**2002**	**2003**	**2001 - 2003**	**Change (2000 to 2003)**
Death in low mortality DRGs	0.30%	0.28%	0.28%	0.28%	0.28%	-5.69%
Failure to rescue	16.30%	15.75%	14.97%	13.96%	14.84%	-14.36%
Iatrogenic pneumothorax	0.10%	0.10%	0.10%	0.09%	0.10%	-8.64%
Post-op hip fracture	0.06%	0.06%	0.06%	0.06%	0.06%	-8.18%
Post-op hemorrhage or hematoma	0.26%	0.25%	0.24%	0.23%	0.24%	-11.83%
Post-op abdominal wound dehiscence	0.37%	0.38%	0.38%	0.35%	0.37%	-4.15%

Patient Safety Incidents & Rates that Worsened Over Time						
Incident	**2000**	**2001**	**2002**	**2003**	**2001 - 2003**	**Change (2000 to 2003)**
Decubitus ulcer	2.88%	3.01%	3.12%	3.29%	3.14%	14.31%
Post-op physiologic and metabolic derangements	0.13%	0.14%	0.13%	0.15%	0.14%	11.66%
Post-op respiratory failure	0.66%	0.71%	0.77%	0.81%	0.76%	22.44%
Post-op pulmonary embolism or deep vein thrombosis	1.02%	1.08%	1.15%	1.22%	1.15%	19.53%
Post-op sepsis	1.28%	1.30%	1.40%	1.54%	1.41%	20.08%
Selected infections due to medical care	0.26%	0.28%	0.30%	0.32%	6.30%	22.50%

Appendix F: Distribution of PSI Incidents & Associated Mortality

Classification by # of PSI incidents per patient by year

# PSI Incidents per Patient	2003	2002	2001	2001-2003 Total Patients	2001-2003 Total Deaths	Mortality Rate by # Events per Patient
0	12,848,751	12,584,929	12,268,568	37,702,248	1,347,625	3.57%
1	368,634	352,306	332,290	1,053,230	266,844	25.34%
2	19,349	18,360	16,655	54,364	28,668	52.73%
3	1,685	1,473	1,351	4,509	3,004	66.62%
4	165	132	111	408	325	79.66%
5	6	8	9	23	22	95.65%
6	1	0	1	2	2	100.00%
Total	13,238,591	12,957,208	12,618,985	38,814,784	1,646,490	4.24%
>0 Events	389,840	372,279	350,417	1,112,536	298,865	26.86%
>1 Event	21,206	19,973	18,127	59,306	32,021	53.99%

Classification of mortality by # of PSI incidents per patient by year (Excluding death in low mortality DRGs and failure to rescue)

# PSI Incidents per Patient	2003	2002	2001	2001-2003 Total Patients	2001-2003 Total Deaths	Mortality Rate by # Events per Patient
0	12,848,751	12,584,929	12,268,568	37,702,248	1,347,625	3.57%
1	307,433	291,404	273,488	872,325	85,939	9.85%
2	11,176	10,175	9,050	30,401	4,732	15.57%
3	734	622	516	1,872	367	19.60%
4	42	38	23	103	20	19.42%
5	0	0	1	1	0	NA
6	0	0	0	0	0	NA
Total	13,168,136	12,887,168	12,551,646	38,606,950	1,438,656	3.73%
>0 Events	319,385	302,239	283,078	904,702	91,058	10.06%
>1 Event	11,952	10,835	9,590	32,377	5,119	15.81%

Appendix G: Comparisons Between Different Performance Categories (2001 through 2003)

Observed to Expected Ratios (O/E) by PSI and Associated Outcomes					As Compared to the Top 10% Performance				
PSI	ALL	Top 10% O/E Ratios (95% CI)	Middle 80% O/E Ratios	Bottom 10% O/E Ratios (95% CI)	Relative Risk Increase Associated with Bottom 10% Hospitals Compared to Top 10% Hospitals	# of Excess Patient Safety Incidents Among Bottom 10% Performance	# Potentially Avoidable Deaths* Associated with Excess Patient Safety Incidents Among Bottom 10% Performance	Excess Charge* Associated with Excess Patient Safety Incidents Among Bottom 10% Performance (Millions)	Excess Cost^^ Associated with Excess Patient Safety Incidents Among Bottom 10% Performance (Millions)
Death in low mortality DRGs	0.947	0.688 (0.641-0.783)	0.958	1.199 (1.128-1.342)	174.28%	2,696	2,696	NA*	NA*
Decubitus ulcer	0.934	0.686 (0.679-0.700)	0.923	1.258 (1.249-1.278)	183.46%	126,812	9,169	$1,375	$688
Failure to rescue	0.961	0.855 (0.843-0.880)	0.966	1.030 (1.017-1.055	120.43%	28,798	28,798	NA*	NA*
Foreign body left in during procedure	0.981	0.615 (0.535-0.777)	0.981	1.428 (1.292-1.701)	232.01%	21,008	450	$280	$140
Iatrogenic pneumothorax	1.008	0.795 (0.769-0.847)	1.007	1.295 (1.257-1.370)	162.94%	7,164	501	$124	$62
Selected infections due to medical care	0.991	0.668 (0.654-0.696)	0.986	1.403 (1.381-1.446)	210.04%	31,683	1,366	$1,225	$612
Post-op hip fracture	0.975	0.649 (0.580-0.787)	0.991	1.303 (1.190-1.529)	200.88%	1,184	54	$16	$8
Post-op hemorrhage or hematoma	0.997	0.717 (0.689-0.773)	1.008	1.281 (1.238-1.366)	178.53%	6,492	195	$139	$70
Post-op physiologic and metabolic derangements	0.981	0.630 (0.583-0.723)	0.951	1.491 (1.419-1.635)	236.65%	2,486	492	$136	$68
Post-op respiratory failure	1.012	0.752 (0.725-0.805)	0.985	1.483 (1.443-1.564)	197.28%	7,451	1,627	$399	$199
Post-op pulmonary embolism or deep vein thrombosis	1.000	0.790 (0.777-0.817)	0.984	1.391 (1.371-1.432)	176.05%	23,424	1,537	$509	$254
Post-op sepsis	0.977	0.720 (0.691-0.777)	0.944	1.459 (1.415-1.545)	202.70%	6,243	1,368	$360	$180
Post-op abdominal wound dehiscence	0.944	0.675 (0.619-0.788)	0.942	1.300 (.1211-1.477)	192.45%	1,710	165	$69	$34
Average relative risk increase in and # of potentially avoidable patient safety incidents, death, charge and cost associated with Bottom 10% hospitals compared to Top 10% hospitals					**189.82%**	**267,151**	**48,417**	**$4,632**	**$2,316**

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

**Based on previous research done by Zhan C and Miller MR. 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 B. La Mare J, Andrews R, McKenzie D. Practical options for estimating cost of hospital inpatient stays. J Health Care Finance. 2002; 29(1): 1-13

Appendix H: PSI Observed Incident Rates by Year & Overall Patient Safety Performance

Year	Overall Patient Safety Performance	Death in Low Mortality DRGs	Decubitus Ulcer	Failure to Rescue	Foreign Body Left in During Procedure	Iatrogenic Pneumo-thorax	Selected Infections Due to Medical Care	Post-op Hip Fracture	Post-op Hemorrhage or Hematoma	Post-op Physiologic and Metabolic Derange-ments	Post-op Respiratory Failure	Post-op Pulmonary Embolism or Deep Vein Thrombosis	Post-op Sepsis	Post-op Abdominal Wound Dehiscence
2001	Top 10%	0.20%	2.08%	13.70%	0.01%	0.09%	0.24%	0.03%	0.19%	0.09%	0.55%	0.87%	0.92%	0.27%
2002	Top 10%	0.23%	2.19%	13.33%	0.01%	0.10%	0.25%	0.04%	0.18%	0.09%	0.57%	0.95%	0.93%	0.27%
2003	Top 10%	0.19%	2.23%	12.65%	0.01%	0.10%	0.27%	0.04%	0.17%	0.09%	0.64%	0.99%	1.02%	0.26%
Aggregate from 2001-2003	Top 10%	0.21%	2.17%	13.19%	0.01%	0.10%	0.25%	0.04%	0.18%	0.09%	0.59%	0.94%	0.96%	0.26%
% Change from 2001-2003	Top 10%	-4.71%	7.18%	-7.64%	-9.41%	5.11%	10.61%	27.59%	-9.34%	-1.22%	15.24%	13.67%	11.18%	-3.12%
2001	Middle 80%	0.29%	2.81%	15.77%	0.01%	0.11%	0.33%	0.06%	0.25%	0.14%	0.73%	1.08%	1.22%	0.34%
2002	Middle 80%	0.27%	2.88%	14.88%	0.01%	0.11%	0.35%	0.05%	0.25%	0.13%	0.78%	1.16%	1.30%	0.37%
2003	Middle 80%	0.28%	3.05%	13.64%	0.01%	0.11%	0.36%	0.06%	0.24%	0.15%	0.81%	1.24%	1.39%	0.34%
Aggregate from 2001-2003	Middle 80%	0.28%	2.92%	14.69%	0.01%	0.11%	0.35%	0.06%	0.25%	0.14%	0.77%	1.16%	1.31%	0.35%
% Change from 2001-2003	Middle 80%	-3.40%	8.72%	-13.54%	-3.95%	-1.99%	7.72%	-1.45%	-5.47%	4.09%	11.21%	14.93%	14.52%	-2.28%
2001	Bottom 10%	0.31%	3.80%	16.07%	0.01%	0.14%	0.51%	0.07%	0.35%	0.29%	1.19%	1.60%	1.98%	0.46%
2002	Bottom 10%	0.35%	3.93%	15.28%	0.01%	0.14%	0.55%	0.08%	0.32%	0.28%	1.34%	1.74%	2.29%	0.44%
2003	Bottom 10%	0.35%	4.05%	14.60%	0.01%	0.14%	0.59%	0.07%	0.34%	0.30%	1.36%	1.81%	2.39%	0.41%
Aggregate from 2001-2003	Bottom 10%	0.34%	3.93%	15.27%	0.01%	0.14%	0.55%	0.07%	0.33%	0.29%	1.30%	1.72%	2.22%	0.44%
% Change from 2001-2003	Bottom 10%	13.79%	6.78%	-9.15%	16.04%	-2.61%	16.17%	-3.34%	-3.54%	3.99%	14.48%	13.24%	20.99%	-10.11%

Appendix I: PSI Associated Observed Mortality Rate by Year & Overall Patient Safety Performance

Year	Overall Patient Safety Performance	Death in Low Mortality DRGs	Decubitus Ulcer	Failure to Rescue	Foreign Body Left in During Procedure	Iatrogenic Pneumo-thorax	Selected Infections Due to Medical Care	Post-op Hip Fracture	Post-op Hemorr+J1hage or Hematoma	Post-op Physiologic and Metabolic Derangements	Post-op Respiratory Failure	Post-op Pulmonary Embolism or Deep Vein Thrombosis	Post-op Sepsis	Post-op Abdominal Wound Dehiscence
2001	Top 10%	100.00%	10.74%	100.00%	1.82%	15.05%	11.48%	9.52%	4.66%	27.45%	27.30%	10.19%	27.24%	13.95%
2002	Top 10%	100.00%	10.73%	100.00%	2.00%	13.36%	10.72%	13.19%	5.14%	27.33%	29.38%	9.99%	33.27%	12.69%
2003	Top 10%	100.00%	9.46%	100.00%	3.77%	12.36%	9.98%	12.94%	4.42%	16.67%	26.32%	9.56%	24.67%	14.96%
Aggregate from 2001-2003	Top 10%	100.00%	13.18%	100.00%	6.06%	20.15%	14.56%	10.61%	7.49%	19.64%	30.64%	11.77%	29.80%	17.56%
% Change from 2001-2003	Top 10%	NA	-11.91%	NA	107.55%	-17.89%	-13.05%	35.88%	-5.09%	-39.29%	-3.61%	-6.20%	-9.42%	7.22%
2001	Middle 80%	100.00%	12.31%	100.00%	7.64%	17.84%	13.35%	12.46%	6.52%	24.10%	30.11%	12.24%	29.24%	14.95%
2002	Middle 80%	100.00%	11.93%	100.00%	5.17%	16.03%	12.38%	12.91%	5.89%	20.91%	28.81%	11.60%	28.86%	14.30%
2003	Middle 80%	100.00%	11.18%	100.00%	3.16%	16.29%	11.59%	13.53%	5.50%	20.46%	26.25%	10.37%	28.82%	12.80%
Aggregate from 2001-2003	Middle 80%	100.00%	11.78%	100.00%	5.30%	16.71%	12.40%	12.98%	5.96%	21.77%	28.27%	11.34%	28.96%	14.02%
% Change from 2001-2003	Middle 80%	NA	-9.15%	NA	-58.63%	-8.73%	-13.19%	8.57%	-15.64%	-15.11%	-12.81%	-15.28%	-1.43%	-14.42%
2001	Bottom 10%	100.00%	13.83%	100.00%	6.67%	22.06%	15.52%	14.66%	7.36%	18.47%	30.26%	12.34%	27.98%	20.30%
2002	Bottom 10%	100.00%	12.95%	100.00%	8.33%	19.67%	14.19%	10.32%	7.76%	20.00%	31.90%	11.88%	31.60%	18.46%
2003	Bottom 10%	100.00%	12.81%	100.00%	3.60%	18.80%	14.12%	6.90%	7.35%	20.39%	29.74%	11.19%	29.61%	13.59%
Aggregate from 2001-2003	Bottom 10%	100.00%	10.29%	100.00%	2.53%	13.54%	10.68%	12.13%	4.74%	23.73%	27.60%	9.89%	28.25%	13.85%
% Change from 2001-2003	Bottom 10%	NA	-7.36%	NA	-45.95%	-14.77%	-9.05%	-52.94%	-0.05%	10.39%	-1.71%	-9.33%	5.80%	-33.06%

Appendix J: Pearson's Correlation Between PSIs & Patient Safety Overall Performance Score

PSI	Teaching Hospitals		Non Teaching Hospitals		All Hospitals	
	Patient Safety Overall Performance Score	Significance	Patient Safety Overall Performance Score	Significance	Patient Safety Overall Performance Score	Significance
Death in low mortality DRGs	0.266	p = 0.000	0.413	p = 0.000	0.323	p = 0.000
Decubitus ulcer	0.457	p = 0.000	0.413	p = 0.000	0.448	p = 0.000
Failure to rescue	0.313	p = 0.000	0.331	p = 0.000	0.316	p = 0.000
Foreign body left in during procedure	0.279	p = 0.000	0.271	p = 0.000	0.277	p = 0.000
Iatrogenic pneumothorax	0.438	p = 0.000	0.276	p = 0.000	0.379	p = 0.000
Selected infections due to medical care	0.540	p = 0.000	0.480	p = 0.000	0.519	p = 0.000
Post-op hip fracture	0.301	p = 0.000	0.280	p = 0.000	0.290	p = 0.000
Post-op hemorrhage or hematoma	0.355	p = 0.000	0.309	p = 0.000	0.337	p = 0.000
Post-op physiologic and metabolic derangements	0.406	p = 0.000	0.376	p = 0.000	0.395	p = 0.000
Post-op respiratory failure	0.370	p = 0.000	0.358	p = 0.000	0.365	p = 0.000
Post-op pulmonary embolism or deep vein thrombosis	0.442	p = 0.000	0.312	p = 0.000	0.409	p = 0.000
Post-op sepsis	0.501	p = 0.000	0.400	p = 0.000	0.460	p = 0.000
Post-op wound dehiscence in abdominopelvic surgical patients	0.275	p = 0.000	0.393	p = 0.000	0.321	p = 0.000