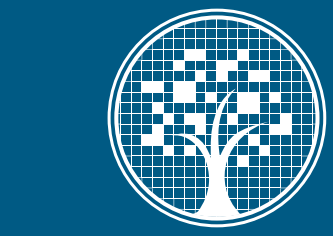

HCUP Methods Series

Patient Safety in Hospitals in 2004: Toward Understanding Variation Across States

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PATIENT SAFETY IN HOSPITALS IN 2004: TOWARD UNDERSTANDING VARIATION ACROSS STATES

By Susan Raetzman, MSPH, Elizabeth Stranges, MS, Rosanna Coffey, PhD, Marguerite Barrett, MS, Roxanne Andrews, PhD, Ernest Moy, MPH, Jeff Brady, MPH

EXECUTIVE SUMMARY

Background

The emergence of patient safety as a contemporary health issue has resulted in the development and use of measures, such as AHRQ's Patient Safety Indicators (PSI), to track progress over time in improving patient safety. National PSI rates have been made available annually in the *National Healthcare Quality Report (NHQR)*, and state-level PSIs will be released in the 2007 edition of the *NHQR State Snapshots* available on the Web in early 2008. The purpose of this analysis is to explore the extent to which differences across states in PSI scores can be explained and to describe what might account for those differences. The results are intended to help HCUP Partners and AHRQ respond to inquiries about state-level PSI rate variation, which can be substantial.

Study Approach

The analysis was performed on the nine State Snapshot PSIs which will be released in the 2007 edition of the *NHQR State Snapshots;* the state PSI rates were obtained by applying AHRQ Quality Indicator software to the HCUP State Inpatient Databases (SID) dataset.[1,2] The PSIs for up to 37 states were compared against 58 state-level factors that can be broadly categorized as (a) state policies that are generally intended to affect the quality of health care delivered in the state; (b) hospital characteristics; (c) coding practices; and (d) other characteristics such as population and health system characteristics. To the extent possible, we included factors in the external environment and factors inside hospitals that were conceptually related to medical error, quality improvement, or specific patient safety events. Separate correlations of each PSI and each state-specific factor were conducted (i.e., for each PSI, the analyses statistically examined the relationship between the state rates and a particular state-specific factor).

Findings

Overall, we found that only about one in five correlations between the State Snapshot PSIs and potential explanatory factors were statistically significant. The number of statistically significant associations for the nine individual PSIs range widely from 0 to 21 out of a possible 60 associations, including dummy variables (Table 1). In addition, the nature of the significant PSI/factor associations is mixed in that some have plausible explanations and others do not. In the latter case, these may be artifacts of other phenomenon or the result of chance statistical significance, given that nearly 550 correlation analyses were performed (i.e., 9 PSIs times 60 independent variables).

Although there is no pattern to which associations are statistically significant or their direction at the individual PSI or factor level, a somewhat different picture is revealed when factors are aggregated. Among factor categories, the most consistent analysis results are those pertaining to the role of coding in explaining variation in state-level PSIs. Taken together, the coding factors accounted for one-third (33 percent) of statistically significant associations between State Snapshot PSIs and explanatory factors. The findings for this category are strengthened by the fact that associations were consistently positive in direction (i.e., increases in factor values were associated with higher PSI rates). The average number of diagnosis fields filled for discharges in

[1] For further detail, see *HCUP Methods Series Report #2007-06*.

[2] See Appendix B for a list of the 37 HCUP Partner Organizations.

2004 yielded the largest number of statistically significant associations, suggesting that higher PSI rates sometimes may reflect greater attention to coding, not just worse health outcomes.

Discussion

The analysis of State Snapshot PSIs identified few state-level factors that showed a consistent pattern of association with the nine state-level PSI rates. We suspect that many of the factors that should influence patient safety indicators are too new in development or too remote from where safety problems occur to find strong associations in this state-level analysis. For example, state programs that proactively disseminated information to the public or providers were relatively new in the early 2000s. Also, medical errors and their prevention occur at the provider, not the state, level. With this simple and aggregated analysis, we are not surprised to find few conclusive results.

As expected, the strongest result was coding practices. In a similar analysis of state-level PSIs and Prevention Quality Indicators (PQIs) conducted in 2003 using 2000 data, one type of coding practice (use of E codes) had a strong, consistent relationship with PSIs. In the current analysis, the average number of diagnosis fields used was an important factor; more fields were associated with higher PSI rates. This suggests that states that are leading the way to safer medical practice should expand the number of diagnosis codes reported and collected. This would make room for reporting of medical errors for complex clinical patients who already have numerous conditions coded on their discharge records. More and better reporting about patient safety events is essential to learn about and make improvements in the quality of care.

One reassuring result is the lack of consistent statistical relations between patient and hospital characteristics and safety measures. This supports our earlier finings and the conventional wisdom that errors are unintentional, random events that can affect any patient and that all hospitals need to improve safety.

PATIENT SAFETY IN HOSPITALS IN 2004:
TOWARD UNDERSTANDING VARIATION ACROSS STATES

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BACKGROUND

In 1999, the Institute of Medicine released *To Err is Human* and awakened health care providers, policymakers, the media, and the general public to the real risk of medical error faced by patients who receive hospital care. Since then, numerous efforts have been directed at identifying practices, particularly "system" changes, which may improve patient safety in hospitals. Quality improvement at the broadest level has become associated with well-known names—Deming, Six Sigma and, in health care, the Institute for Healthcare Improvement (IHI). Evidence-based practices—from protocols for hand hygiene to rapid response teams—are being promoted to reduce hospital-based medical error. The ongoing legislative, regulatory, and educational activities at the state and national levels signal the continued significance of patient safety.

With the rise of these activities has been the development and use of a variety of patient safety measures. For example, in 2002, AHRQ Patient Safety Indicators (PSIs) were developed as a tool that uses administrative data to identify potential indicators of patient safety events and medical errors. The PSIs are designed to draw attention to possible medical, surgical and obstetric patient safety event levels and trends that may require further study.

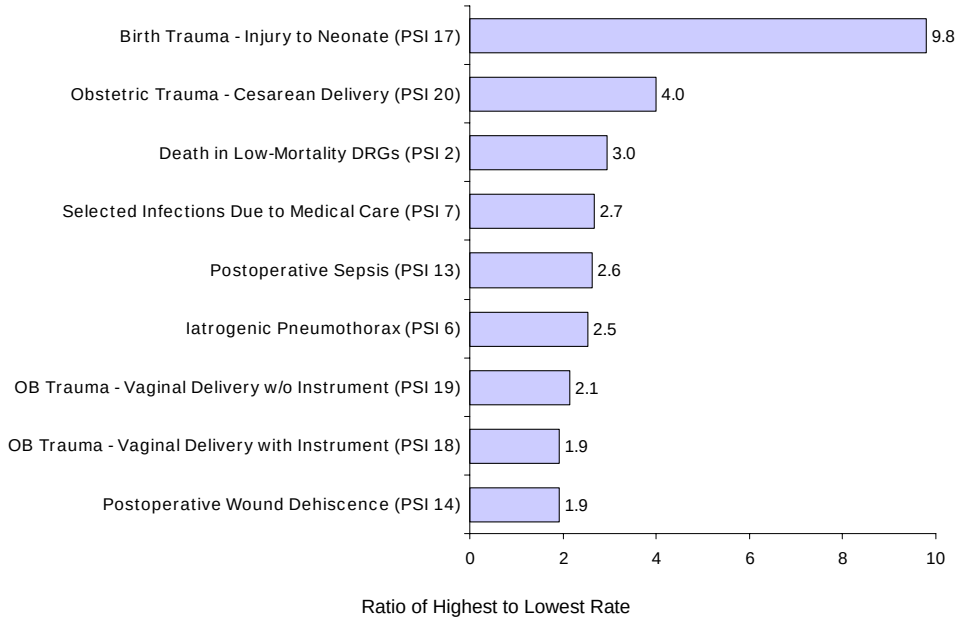
Patient safety measures, such as the PSIs, can also be useful for tracking aggregate progress over time in improving patient safety. National PSI rates are made available annually in the *National Healthcare Quality Report (NHQR)* for this very purpose. And, starting with the 2007 edition of the *NHQR State Snapshots*, available on the Web in early 2008, nine state-level PSIs will be released. Specific states also are increasingly considering it their responsibility to provide information to residents about patient safety in hospitals within their borders. Colorado, Florida, Georgia, New York, Oregon, Utah, and Wisconsin currently make some form of safety information available to the public, and other states have indicated plans to follow suit.

As this kind of information becomes more accessible and feeds public interest in the status of patient safety in their hospitals, questions will likely arise about rates, both in absolute and comparative terms. According to the most readily available patient safety measures, the PSIs, the amount of variation in rates across states can be substantial (Figure 1). The state-level variation in rates for the State Snapshot PSIs, as measured by the ratio of the state with the highest rate to the state with the lowest rate, ranges from 1.9 for postoperative wound dehiscence (PSI 14) and obstetric trauma during vaginal delivery with instrument (PSI 18) to 9.8 for injury to neonates (PSI 17).[3] And, we found in a similar analysis conducted in 2003 using 2000 data that the state-level variation among PSI rates is greater than among Prevention Quality Indicators.

The purpose of this analysis is to explore the extent to which differences across states in PSI scores can be explained and to describe what might account for those differences. The results are intended to help HCUP Partners and AHRQ respond to inquiries about state-by-state variation in PSI rates.

[3] See Appendix A for the amount of variation in state-level rates for other PSIs.

FIGURE 1. STATE VARIATION IN SELECTED PSIs, 2004



STUDY APPROACH

Variables

This study analyzes variation in the nine state-level PSIs which will be reported in the 2007 edition of the *NHQR State Snapshots*. For the purpose of the analysis, these PSIs are referred to as State Snapshot PSIs. Figure 2 below provides a list of the PSIs (dependent variables) that are the focus of this analysis as well as the state-level factors that served as independent variables. The state PSI rates used in this analysis were obtained by applying AHRQ Quality Indicator software to the HCUP State Inpatient Databases (SID) dataset.[4,5]

These rates, for up to 37 states,[6] were compared against 58 state-level factors that can be broadly categorized as shown below. To the extent possible, we included factors in the external environment and factors inside hospitals that were conceptually related to medical error, quality improvement, or specific patient safety events. Appendix C is a list of the specific measures and sources which were used in the analyses.

- State policy characteristics or state policies that are generally intended to affect the quality of health care delivered in the state (e.g., data reporting requirements, other patient safety activities, health provider regulation);

[4] For further detail, see *HCUP Methods Series Report #2007-06*.
[5] See Appendix B for a list of the 37 HCUP Partner Organizations.
[6] In the case of three of the 9 State Snapshot PSIs analyzed, four or fewer states did not have statistically reliable rates, as their relative standard errors were greater than 30 percent; these PSIs remained in the study but the analysis of variation was based on a slightly smaller number of state observations.

FIGURE 2. PSIs AND STATE-LEVEL FACTORS USED IN ANALYSIS

Patient Safety Indicators:

PROVIDER-LEVEL PSIs

Death in low mortality DRGs (PSI 2)
Iatrogenic pneumothorax (PSI 6)
Selected infections due to medical care (PSI 7)
Postoperative sepsis (PSI 13)
Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)

PROVIDER-LEVEL PSIs, continued

Birth trauma – injury to neonate (PSI 17)
Obstetric trauma – vaginal delivery with instrument (PSI 18)
Obstetric trauma – vaginal delivery without instrument (PSI 19)
Obstetric trauma – cesarean delivery (PSI 20)

State Level Factors:

STATE POLICY CHARACTERISTICS

Patient Safety Infrastructure

Mandatory adverse event reporting, by year end 2004
Proactive dissemination of information to public, by year end 2004
Proactive feedback of information to providers, by year end 2004
Patient safety center, by year end 2004
Patient safety coalition, by year end 2004
Mandatory adverse event reporting, by year end 2003
Proactive dissemination of information to public, by year end 2003
Proactive feedback of information to providers, by year end 2003

Provider Regulation

Prohibitions against mandatory nurse overtime, by year end 2004
Prohibitions against mandatory nurse overtime, by year end 2003

HOSPITAL CHARACTERISTICS

Safety Processes

% of hospitals in QIO project on surgical infection prevention
% of hospitals complying with JCAHO goals for patient identification
% of hospitals complying with JCAHO goals for communication
% of hospitals complying with JCAHO goal for hand hygiene

Institutional Culture

% of hospitals with Nurse Magnet Certification
% of Medicare pneumonia patients receiving recommended care
% of AMI patients receiving recommended care
% of staff responding positive on teamwork across unit
% of staff responding positive on handoffs/ transitions
% of staff responding positive on nonpunitive response to error
% of hospitals that have never reported to National Practitioner Data Bank

Staffing

% of staff responding positive on staffing
Registered nurses per 1000 inpatient days
Nursing FTEs per 1000 inpatient days
Hospitalists per 100,000 inpatient days

Case mix

% of discharges with Medicare as primary
% of discharges with Medicaid as primary
% of discharges with private insurance as primary
% of discharges uninsured

HOSPITAL CHARACTERISTICS, continued

Births as share of discharges
Average number of operating room procedures per adult discharge
Medicare case-mix index

Other Hospital Characteristics

Discharges per 100,000 population
Surgeries per 1,000 adults
% of discharges from hospitals with < 100 beds
% of discharges from hospitals with > 300 beds
% of discharges from for-profit hospitals
% of discharges from teaching hospitals
Average length of stay
Occupancy rate

CODING

Percent of discharges with at least one E-code
Average number of diagnosis fields used in 2004
% change in number of diagnosis fields used from 2001 to 2004

OTHER CHARACTERISTICS

Socio-demographics

Census region
% of population residing in a rural area
% of population with income below poverty
% of population that is non-white
% of population with college degree

Health-related Population Characteristics

% of population that is overweight or obese
Teen birth rate
% of population diagnosed with pregnancy-related diabetes
% of population diagnosed with diabetes
% of population that has received pneumococcal vaccination
% of population with emphesyma
% of population that currently smokes tobacco

Physician Characteristics

Generalists physicians per 100,000 population
Specialist physicians per 100,000 population
Serious Board disciplinary actions per 1,000 physicians

- Hospital characteristics (e.g., safety processes utilized, staffing levels, payer mix);
- Coding practices (e.g., use of external cause of injury codes, diagnosis fields used); and
- Other characteristics (e.g., socio-demographics, health-related population characteristics, physician characteristics).

Correlation

To explore potential sources of variation in state-level PSIs for 2004, we employed a statistical technique called correlation and used the most common type, Pearson's correlation. A correlation ratio measures whether one variable moves with another so that there is a seeming relationship between two variables: the PSIs (dependent variable) and the other factors (independent variables). It also indicates the strength and direction of the relationship.

Separate correlations of each PSI and each state-specific factor were conducted (i.e., for each PSI, the analyses statistically examined the relationship between the state rates and a particular state-specific factor).[7] For example, the 37 state rates for PSI 7—selected infections due to medical care—were related to whether each state had an adverse event reporting system. The same state PSI rates also were related to the percent of hospitals in each state that participated in a QIO project for reducing infections. This process of measuring the correlation between the state rates for a single PSI and a state-specific factor continued for all state factors. For efficiency, we conducted correlations for all PSI-factor combinations. In most cases, there was conceptual support or a basis in the literature for testing these relationships.

The main result of a correlation is the correlation coefficient or "r," which ranges from -1 to +1. When "r" is zero, there is no relationship between the variables. The closer it is to -1 or +1, the closer the relationship is to a perfect linear association. When "r" is positive, one variable gets larger as the other gets larger; when "r" is negative, one variable gets smaller as the other gets larger (also called an "inverse" correlation).

Furthermore, squaring the correlation coefficient produces "r square," which is the percent of variation in one variable that is related to the variation in the other variable. Conceptually, the "r square" represents the ratio of variation shared by the two variables (shared variance) to the variation of each variable separately (separate variance). Therefore, we use the "r square" as a way to tell us what percentage of the variation in the state-level PSI rates is associated with variation in a specific state factor.

[7] The approach of conducting bivariate analyses of the relationship between each PSI and a single state-level factor is consistent with the approach used in the analysis of PSI rates for the year 2000 presented to HCUP partners in 2003. As before, the small number of observations at the state level (no more than 37) ruled out the option of doing multiple comparisons at a time, e.g., multiple regression.

Interpreting Correlation

Chance Statistical Significance. When many correlations are being analyzed, just by chance, a relationship may be statistically significant. As a result, we look for broad patterns that hold over many of the same types of analyses, before considering those worthy of discussion or action.

Not Causation. Correlations are statistical tools that measure associations. Analysts often assume cause when they see relationships, especially when they devise regression models for explaining behavior. It is a matter of speculation to use our understanding of the health care system to make statements about what is happening based on associations and relationships that have been measured. However, correlations do not imply or determine cause. For the purposes of descriptive comparisons here, X could be causing Y, Y could be causing X, or something else altogether could be influencing both to move generally in the same or opposite directions across the States (known as a "spurious Y-X relationship").

Separate Associations. In this state-level analysis, the small number of observations (a maximum of 37 states) means that we could not do multivariate analyses and that we need to qualify many conclusions. All analyses were done as bivariate comparisons in that the PSI rates were related to other factors one at a time. The disadvantage of this approach is that there is no regard for how multiple factors relate at the same time. That is, by looking at each factor individually, we do not understand how they work together. Additional factors generally increase the amount of variance that is "explained," but multiple factors can be correlated or redundant with each other, as well. Moreover, excluded factors that relate to the relationship we are studying might also affect the results and conclusions if the excluded factors could be measured and accounted for in the analysis. The only way to deal with these excluded, external factors that influence the relationship is either to find a measure for the excluded factor and include it in the analysis or to discuss it qualitatively.

General Caveats

Limits of Aggregation. Findings about aggregate associations may or may not hold for individual associations. That is, parallel movements in variables at an aggregate state level may not be parallel at the individual person or discharge level. For example, postoperative respiratory failure and smoking prevalence may move in the same direction at the state level, but this does not necessarily mean that individuals who experience respiratory failure as a postoperative complication are smokers. (We might speculate that this is the case but an empirical basis for that conclusion would require an analysis of individual discharge data supplemented with a special survey on smoking.)

State versus Hospital-Level Analysis. A limitation of state-level analysis is that it cannot control for hospital-specific relationships between PSIs and factors being analyzed. For example, a hospital-level analysis can take into consideration the safety-related practices, staffing characteristics, culture, size and other characteristics of each hospital as they relate to the rate at which patients of the same hospital experience a complication. While the state-level analysis conducted also takes these factors into account, it does so by aggregating these individual hospital characteristics and corresponding complication rates to the state level. The disadvantage is that such an aggregation may mask critical distinctions at the individual hospital level—such as behaviors that are most directly connected to how care is provided and whether complications occur—that help to explain variation in PSIs.

Data Congruence. To the extent possible, this study analyzed PSIs and state-level factors by using data sources that described the same time frame, hospital sample, population subgroup, or other aspect of both independent and dependent variables. However, in some cases, we were not able to ensure such congruence. Although we cannot know with certainty whether such incongruence had an effect on the results, being mindful of these data differences and their possible impact is important when interpreting results. For example, although the PSIs are for community, non-rehabilitation hospitals, some factors describe the broader set of hospitals in a state. In addition, although the state-level factors generally relied on data sources that described 2004,[8] an exception was made to include several factors using 2005 data as a proxy for safety practice activities in the prior year (for which no data were available); this accommodation was made because of the importance of process changes for improving patient safety. Another example is that resident population characteristics differ somewhat from those of hospital patients both because hospital patients are not a representative sample of the general population and because it is not uncommon for patients to seek care from a major health facility in a neighboring state, particularly when it is nearby. We attempt to identify such data incongruence for findings presented below.

FINDINGS

In examining the results of the correlation analysis, we look first at individual PSIs and then at possible patterns across PSIs (i.e., within factor categories). When interpreting positive and negative associations, readers are reminded that higher PSI rates mean more reports of patient safety events. Therefore, better outcomes are represented by lower PSI rates. In addition, it was not possible to frame the potential explanatory factors in a consistent direction (i.e., such that either higher values were always viewed as desirable or lower values were always viewed as desirable). So, depending on the PSI/factor combination, either a positive or a negative association could be expected to produce better – that is, lower – PSI rates.

Individual PSIs

Overall, we found that only about one in five correlations between the State Snapshot PSIs and potential explanatory factors were statistically significant. The number of statistically significant associations for individual PSIs range widely from 0 to 21 out of a possible 60 associations, including dummy variables (Table 1[9]).[10] At one extreme of this range is PSI 14 for postoperative wound dehiscence in abdominopelvic surgical patients with no statistically significant associations, followed closely by PSI 19 for obstetric trauma from vaginal delivery without instrument. At the other end of the range with more than 18 statistically significant associations each are two PSIs concerning obstetric trauma (cesarean delivery (PSI 20) and vaginal delivery with instrument (PSI 18)).

[8] In the case of state policy characteristics, we included the previous year (2003) on the basis that a policy needs to be in place for a minimum period of time before it can, potentially, have an impact.
[9] See Appendix D for the percent of variation explained by these statistically significant associations.
[10] See Appendix E for the results of analysis of variation in state-level rates for 22 of 27 AHRQ PSIs. Five PSIs were excluded from this broader analysis either because the measures were not reliable for most states or because of concerns about the validity of the measures themselves. In the case of seven of the 22 PSIs analyzed, four or fewer states did not have statistically reliable rates; these PSIs remained in the study but the analysis of variation was based on a slightly smaller number of state observations.

TABLE 1. STATISTICAL SIGNIFICANCE OF ASSOCIATIONS BETWEEN STATE SNAPSHOT PSIs AND EXPLANATORY FACTORS*

Potential Explanatory Factors	**Total PSIs with Significant Associations (out of 9)**	Death in low mortality DRGs (PSI 2)	Iatrogenic pneumothorax (PSI 6)	Selected infections due to medical care (PSI 7)	Postoperative sepsis (PSI 13)	Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)	Birth trauma – injury to neonate (PSI 17)	Obstetric trauma – vaginal delivery with instrument (PSI 18)	Obstetric trauma – vaginal delivery without instrument (PSI 19)	Obstetric trauma – cesarean delivery (PSI 20)
Total Factors with Significant Associations (out of 60)		17	8	15	8	0	8	18	3	21
STATE POLICY CHARACTERISTICS										
Patient Safety Infrastructure										
Mandatory adverse event reporting, by year end 2004	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
Proactive dissemination of information to public, by year end 2004	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
Proactive feedback of information to providers, by year end 2004	1	NS	+	NS	NS	NS	NS	NS	NS	NS
Patient safety center, by year end 2004	1	NS	NS	NS	NS	NS	+	NS	NS	NS
Patient safety coalition, by year end 2004	1	NS	+	NS	NS	NS	NS	NS	NS	NS
Mandatory adverse event reporting, by year end 2003	1	—	NS	NS	NS	NS	NS	NS	NS	NS
Proactive dissemination of information to public, by year end 2003	1	NS	+	NS	NS	NS	NS	NS	NS	NS
Proactive feedback of information to providers, by year end 2003	1	NS	+	NS	NS	NS	NS	NS	NS	NS
Provider Regulation										
Prohibitions against mandatory nurse overtime, by year end 2004	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
Prohibitions against mandatory nurse overtime, by year end 2003	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
HOSPITAL CHARACTERISTICS										
Safety Processes										
% of hospitals in QIO project on surgical infection prevention	2	+	NS	NS	NS	NS	+	NS	NS	NS
% of hospitals complying with JCAHO goals for patient identification	1	NS	NS	NS	NS	NS	NS	NS	NS	—
% of hospitals complying with JCAHO goals for communication	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
% of hospitals complying with JCAHO goal for hand hygiene	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
Institutional Culture										
% of hospitals with Nurse Magnet Certification	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
% of Medicare pneumonia patients receiving recommended care	3	NS	NS	—	NS	NS	NS	+	+	NS
% of AMI patients receiving recommended care	2	NS	NS	+	NS	NS	NS	NS	NS	+
% of staff responding positive on teamwork across unit	3	NS	NS	NS	+	NS	NS	—	NS	—
% of staff responding positive on handoffs/ transitions	3	NS	NS	NS	+	NS	NS	—	NS	—
% of staff responding positive on nonpunitive response to error	3	NS	NS	NS	+	NS	NS	—	NS	—
% of hospitals that have never reported to National Practitioner Data Bank	2	NS	NS	—	NS	NS	NS	NS	+	NS
Staffing										
% of staff responding positive on staffing	1	NS	NS	NS	NS	NS	NS	NS	NS	—
Registered nurse FTEs per 1000 inpatient days	1	—	NS	NS	NS	NS	NS	NS	NS	NS
Nursing FTEs per 1000 inpatient days	2	—	NS	NS	NS	NS	NS	NS	NS	—
Hospitalist FTEs per 100,000 inpatient days	2	—	NS	+	NS	NS	NS	NS	NS	NS
Case mix										
% of discharges with Medicare as primary	1	+	NS	NS	NS	NS	NS	NS	NS	NS
% of discharges with Medicaid as primary	1	NS	NS	NS	NS	NS	NS	—	NS	NS
% of discharges with private insurance as primary	2	—	NS	NS	NS	NS	NS	+	NS	NS
% of discharges uninsured	2	NS	NS	NS	NS	NS	NS	—	NS	—
Births as share of discharges	1	—	NS	NS	NS	NS	NS	NS	NS	NS
Average number of operating room procedures per adult discharge	2	—	+	NS	NS	NS	NS	NS	NS	NS
Medicare case-mix index	2	—	NS	NS	NS	NS	NS	+	NS	NS

Potential Explanatory Factors	Total PSIs with Significant Associations (out of 9)	Death in low mortality DRGs (PSI 2)	Iatrogenic pneumothorax (PSI 6)	Selected infections due to medical care (PSI 7)	Postoperative sepsis (PSI 13)	Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)	Birth trauma – injury to neonate (PSI 17)	Obstetric trauma – vaginal delivery with instrument (PSI 18)	Obstetric trauma – vaginal delivery without instrument (PSI 19)	Obstetric trauma – cesarean delivery (PSI 20)
Other Hospital Characteristics										
Discharges per 100,000 population	2	NS	NS	NS	NS	NS	NS	—	NS	—
Surgeries per 1,000 adults	2	—	+	NS	NS	NS	NS	NS	NS	NS
% of discharges from hospitals with < 100 beds	3	NS	NS	—	—	NS	NS	+	NS	NS
% of discharges from hospitals with > 300 beds	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
% of discharges from for-profit hospitals	2	NS	NS	NS	NS	NS	NS	—	NS	—
% of discharges from teaching hospitals	1	NS	NS	NS	NS	NS	NS	NS	NS	+
Average length of stay	0	NS	NS	NS	NS	NS	NS	NS	NS	NS
Occupancy rate	1	NS	NS	+	NS	NS	NS	NS	NS	NS
CODING										
Percent of discharges with at least one E-code	3	NS	+	NS	NS	NS	+	NS	NS	+
Average number of diagnosis fields used in 2004	4	+	NS	+	+	NS	+	NS	NS	NS
% change in number of diagnosis fields used from 2001 to 2004	2	NS	NS	NS	+	NS	+	NS	NS	NS
OTHER CHARACTERISTICS										
Socio-demographics										
Census region										
West census region (compared to South census region)	1	—	NS	NS	NS	NS	NS	NS	NS	NS
Midwest census region (compared to South census region)	3	NS	NS	—	NS	NS	NS	+	+	NS
Northeast census region (compared to South census region)	1	NS	NS	NS	NS	NS	NS	NS	NS	+
% of population residing in a rural area	2	+	NS	—	NS	NS	NS	NS	NS	NS
% of population with income below poverty	3	NS	NS	NS	NS	NS	—	—	NS	—
% of population that is non-white	3	NS	NS	+	NS	NS	NS	—	NS	—
% of population with college degree	4	NS	NS	+	NS	NS	+	+	NS	+
Health-related Population Characteristics										
% of population that is overweight or obese	3	NS	—	—	NS	NS	NS	NS	NS	—
Teen birth rate	2	NS	NS	NS	NS	NS	NS	—	NS	—
% of population diagnosed with pregnancy-related diabetes	1	NS	NS	+	NS	NS	NS	NS	NS	NS
% of population diagnosed with diabetes	3	+	NS	NS	NS	NS	NS	—	NS	—
% of 65+ population that has received pneumococcal vaccination	3	NS	NS	NS	—	NS	NS	+	NS	+
% of population with emphesyma	1	+	NS	NS	NS	NS	NS	NS	NS	NS
% of population that currently smokes tobacco	1	+	NS	NS	NS	NS	NS	NS	NS	NS
Physician Characteristics										
Generalists physicians per 100,000 population	2	NS	NS	—	—	NS	NS	NS	NS	NS
Specialist physicians per 100,000 population	3	NS	NS	+	NS	NS	+	NS	NS	+
Serious Board disciplinary actions per 1,000 physicians	0	NS	NS	NS	NS	NS	NS	NS	NS	NS

* Positive sign (+) indicates positive association, statistically significant at p<0.05; negative sign (--) indicates negative association, statistically significant at p<0.05; NS indicates no statistically significant association.

The nature of the significant PSI/factor associations is mixed in that some have plausible explanations and others do not. In the latter case, these may be artifacts of other phenomenon or the result of chance statistical significance, given that nearly 550 correlation analyses were performed (i.e., 9 PSIs times 60 independent variables). Take PSI 2 for death in low mortality DRGs where, because of the objective basis for this outcome, reported rates for this PSI are typically considered reliable. As might be expected, three hospital staffing factors are negatively associated with PSI 2 (i.e., higher staff ratios are associated with lower PSI rates), and the prevalence of several patient risk factors (e.g., diabetes, emphysema, smoking) is positively associated with the PSI. What is less clear is why participation in surgical infection prevention safety processes is positively correlated with PSI 2, or why the number of operating room procedures per discharge and surgeries per adult are negatively correlated.

To demonstrate how the interpretation of the analysis results is further complicated, the same two factors that are negatively correlated with PSI 2 – the number of operating room procedures per

discharge and surgeries per adult – are positively correlated with iatrogenic pneumothorax (PSI 6). The denominators for both PSIs include surgical cases. The analysis also found four positive, statistically significant associations between PSI 6 and state policy characteristics supporting the patient safety infrastructure (i.e., presence of policy is associated with higher PSI rates). A hypothesis for this finding is that stronger, more proactive policies may encourage better reporting, plus providers may be more willing to report iatrogenic pneumothorax because it is less stigmatized as a complication. An alternative view is that iatrogenic pneumothorax rates are accurate reflections of poor preparation for operating room procedures and any policy association is spurious.

The obstetric trauma PSIs provide a final example of the mixed correlation results from this analysis exploring possible factors associated with state-level variation in PSI rates. On the one hand, it could be considered consistent with the higher rates of episiotomies (in an effort to reduce risk of laceration) among patients with higher socio-economic status that PSI 18 (obstetric trauma–vaginal delivery with instrument) is positively associated with share of the population with a college degree and negatively associated with share of the population in poverty or non-white. Similarly, it is not entirely surprising to find that rates of obstetric trauma–cesarean delivery are positively associated with the share of discharges from teaching hospitals, where more complicated deliveries are likely to occur. It is not obvious why the share of the elderly population vaccinated for pneumococcal disease correlates with increased obstetric trauma.

Factor Categories

Although there is no pattern to which PSI/factor associations are statistically significant or to their direction at the individual PSI or factor level, a somewhat different picture is revealed when factors are aggregated. Table 2 presents the number and share of statistically significant PSIs by factor category and subcategory. [11]

Among factor categories, the most consistent analysis results are those pertaining to the role of coding in explaining variation in state-level PSIs. PSI rates have the potential to be affected by a variety of state and hospital-level coding practices. Specific coding factors explored in this analysis were the percent of discharges with at least one E code, the average number of diagnosis fields filled for discharges in 2004,[12] and the percent change in number of diagnosis fields used from 2001 to 2004. The analysis produced a statistically significant association between at least one of these factors and the PSI for six of the nine State Snapshot PSIs. Taken together, these coding factors resulted in statistically significant associations for one-third (33 percent) of correlations analyses performed. The findings for this category are strengthened by the fact that associations are consistently positive in direction (i.e., increases in factor values were associated with higher PSI rates).

Even though coding is identified by this analysis as an important factor category associated with State Snapshot PSI rates, E code use was not the specific factor that was most prominent.[13]

[11] See Appendix F for an analysis of provider-level and area-level PSI pairs.
[12] The maximum number of fields provided on the claim form ranges from 9 to 30 among the States in this analysis.
[13] Although none of the nine State Snapshots PSIs rely on E codes, the association with E code usage was statistically significant for three of these measures. See Appendix G for analysis of the relationship between E code usage and state rates for more PSIs.

TABLE 2. ASSOCIATIONS BETWEEN STATE SNAPSHOT PSIs AND EXPLANATORY FACTORS, BY FACTOR CATEGORY

Explanatory Factor Categories	Statistically significant	Not statistically significant	Statistically significant share
State Policy Characteristics	6	84	7%
Patient Safety Infrastructure	6	66	8%
Provider Regulation	0	18	0%
Hospital Characteristics	47	223	17%
Safety Processes	3	33	8%
Institutional Culture	16	47	25%
Staffing	6	30	17%
Case mix	11	52	17%
Other Hospital Characteristics	11	61	15%
Coding	9	18	33%
Other Characteristics	36	117	24%
*Socio-demographics**	17	46	27%
Health-related Population Characteristics	14	49	22%
Physician Characteristics	5	22	19%

*The counts of associations in the socio-demographic subcategory include the results for three dummy variables representing region.

Rather, the average number of diagnosis fields filled for discharges in 2004 yielded the largest number of statistically significant associations (i.e., an increase in the average number of diagnosis fields filled was associated with an increase in the PSI rate). These results contribute to the point of view that the opportunity to code more thoroughly can result in better identification of patient safety events which, in turn, may increase PSI rates. Despite the short-term challenge of differentiating PSI trends that reflect coding practices and attention to the patient safety agenda from those that reflect changes in patient safety events, these results reinforce the importance of improving the quality of data reporting.

The other characteristics factor category, which includes socio-demographic, health-related population characteristics and physician characteristics, resulted in the next highest share of statistically significant associations with State Snapshot PSIs (24 percent). Just under half of the significant associations in this category are with obstetric trauma PSIs (PSI 18, PSI 19, and PSI 20), for which plausible explanations of certain relationships were offered above.

While 19 percent of correlations in the hospital characteristics category have statistically significant results, 25 percent of associations in the *institutional culture* subcategory are statistically significant. The majority of these associations are accounted for by three factors (out of a total seven for the category) related to AHRQ's Hospital Survey on Patient Safety Culture.[14] These three factors—the percent of staff responding positively to questions regarding teamwork across units, handoffs and transitions, and nonpunitive reaction to error—have a consistent negative association with postoperative sepsis (PSI 13) and consistent positive associations with obstetric trauma–vaginal delivery with instrument (PSI 18) and obstetric trauma–cesarean delivery (PSI 20). In addition to indicating a relationship between the PSIs and these factors, this pattern may signal a connection between the three factors (e.g., via survey design).

[14] These factors are based on responses to a voluntary survey of 108,621 staff at 382 hospitals nationwide. The survey results were reported at the level of Census subdivision; for this analysis, the result for a subdivision was assigned to each state within the subdivision.

DISCUSSION

Overall, the analysis of State Snapshot PSIs identified few state factors that showed a strong pattern of association with state-level variation in the nine PSI rates. The strongest result was coding practices and this was not surprising. In an earlier, less comprehensive analysis of state-level PSIs, one type of coding practice (use of E codes) had a strong consistent relationship with patient safety indicators. In this analysis, the average number of diagnosis coding fields used was an important factor; more fields were associated with higher PSI rates. This suggests that states that are leading the way to safer medical practice should expand the number of diagnosis codes reported and collected. This would make room for reporting of medical errors for complex clinical patients who already have numerous conditions coded on their discharge records. More and better reporting about patient safety events is essential to learn about and make improvements in the quality of care.

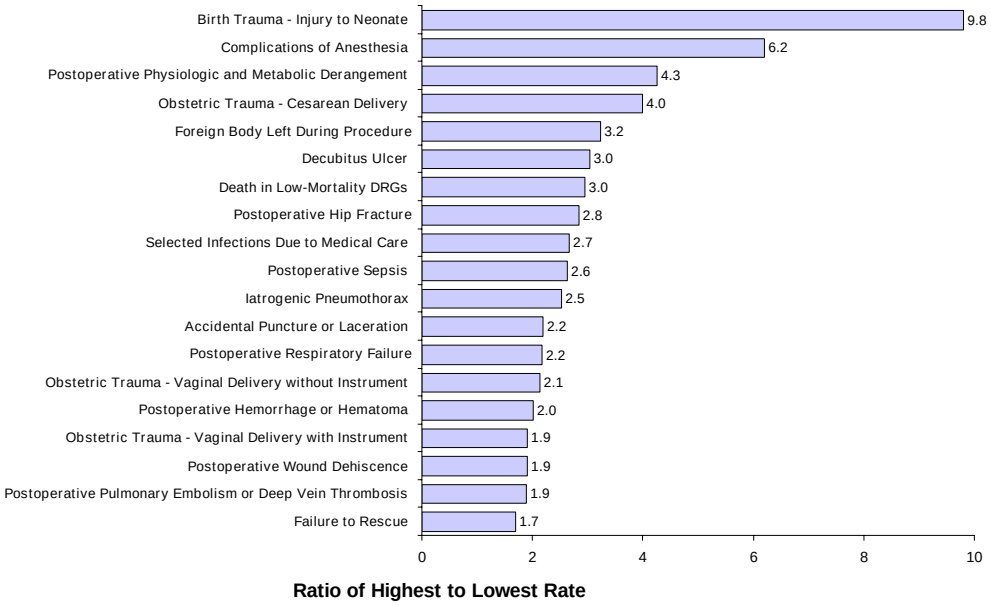
One reassuring result is the lack of consistent statistical relations between patient and hospital characteristics and safety measures. This supports our earlier finings and the conventional wisdom that errors are unintentional, random events that can affect any patient and that all hospitals need to improve safety.

This analysis has a number of serious limitations. In general, the sparse statistically significant findings suggest that they are probably due to statistical chance, rather than robust findings. Furthermore, the inability to tease out the effects of other related factors, or the masking of more pronounced local effects that occurs with aggregation to the state level are other limitations. Thus, it is still possible that factors that did not result in statistically significant associations—or not a large number of them—do correlate with patient safety.

In fact, considering the pervasive absence of a strong or consistent pattern of associations between factors and PSIs, the nature of the findings related to diagnosis fields used is especially important. It is quite plausible that some of the counterintuitive results regarding associations between other factors and PSIs could be an artifact of these coding effects.

For now, more and better quality of reporting for patient safety events is essential because serious shortcomings in patient safety remain. Future analyses may provide further insight into the factors that are driving variation, especially as coding practices at the hospital and state level improve and as factors related to patient safety processes can be more closely measured. States and facilities should continue to look at how care is being delivered in hospitals and what outcomes are being produced. This is particularly important for low performers, but the quality improvement process is ongoing for high performers too as is the opportunity for others to learn from their successes.

APPENDIX A: STATE VARIATION IN PROVIDER-LEVEL PSIs, 2004



APPENDIX B: HCUP PARTNER ORGANIZATIONS

Arizona Department of Health Services
Arkansas Department of Health & Human Services
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Integrated Health Information (Chime, Inc.)
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Health Care Cost Containment Council and Department of Public Health
Indiana Hospital&Health Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Nebraska Hospital Association
Nevada Division of Health Care Financing and Policy, Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health and Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oregon Association of Hospitals and Health Systems
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health and Family Services

APPENDIX C: INDEPENDENT VARIABLES

State Policy Characteristics

Patient Safety Infrastructure

- Mandatory adverse event data collection system in place as of year end 2004 (Source: NASHP)
- Proactive analysis and dissemination to the public of aggregated information reported to the adverse event data collection system as of year end 2004 (Source: NASHP)
- Proactive analysis and feedback to health care providers of information reported to the adverse event data collection system as of year end 2004 (Source: NASHP)
- Patient safety center that is operational (Source: NASHP)
- State-wide, public/private patient safety coalition (Source: NASHP)
- Mandatory adverse event data collection system in place as of year end 2003 (Source: NASHP)
- Proactive analysis and dissemination to the public of aggregated information reported to the adverse event data collection system as of year end 2003 (Source: NASHP)
- Proactive analysis and feedback to health care providers of information reported to the adverse event data collection system as of year end 2003 (Source: NASHP)

Provider Regulation

- Laws/regulations prohibiting mandatory overtime by nurses as of year end 2004, e.g., nurses cannot be disciplined for not working overtime and cannot be required to work more than a certain number of consecutive hours in a given period (Source: extraction of information from document prepared by American Nurse Association)
- Laws/regulations prohibiting mandatory overtime by nurses as of year end 2003, e.g., nurses cannot be disciplined for not working overtime and cannot be required to work more than a certain number of consecutive hours in a given period (Source: extraction of information from document prepared by American Nurse Association)

Hospital Characteristics

Safety Processes

- Percent of hospitals that agreed to work with the Quality Improvement Organization to improve surgical care through prophylactic antibiotic use in 2005 (Sources: CMS, based on an unduplicated count of hospitals working on one of three processes; analysis of HCUP SID)
- Percent of hospitals surveyed in 2005 that meet patient safety goal to improve the accuracy of patient identification (Source: analysis of data from JCAHO on compliance with two sub goals)
- Percent of hospitals surveyed in 2005 that meet patient safety goal to improve the effectiveness of communication among providers (Source: analysis of data from JCAHO on compliance with three sub goals)
- Percent of hospitals surveyed in 2005 that meet patient safety goal to reduce the risk of health care-associated infections by complying with CDC hand hygiene guidelines (Source: JCAHO)

Institutional Culture

- Percent of hospitals that were certified as Nurse Magnet Hospitals by the Commission on Magnet Recognition Program of the American Nurses Credentialing Center (Sources: analysis of information from American Nurses Credentialing Center; analysis of HCUP SID)
- Percent of Medicare pneumonia patients who received recommended hospital care (Source: CMS, Quality Improvement Organization Program)
- Percent of AMI patients who received recommended hospital care, July 2004 to June 2005 (Source: CMS, Hospital Compare)
- Percent of responses regarding teamwork across units that were positive in Hospital Survey on Patient Safety Culture, October 2004 to July 2006 (Source: 2007 database, Agency for Healthcare Research and Quality, reported at level of Census subdivision)
- Percent of responses regarding handoffs and transitions that were positive in Hospital Survey on Patient Safety Culture, October 2004 to July 2006 (Source: 2007 database, Agency for Healthcare Research and Quality, reported at level of Census subdivision)
- Percent of responses regarding nonpunitive reaction to error that were positive in Hospital Survey on Patient Safety Culture, October 2004 to July 2006 (Source: 2007 database, Agency for Healthcare Research and Quality, reported at level of Census subdivision)
- Percent of nonfederal hospitals that have never reported clinical privilege actions to the National Practitioner Data Bank between September 1, 1990 and December 31, 2004 (Source: 2004 Annual Report, National Practitioner Database, Health Resources and Services Administration)

Staffing

- Percent of responses regarding staffing across units that were positive in Hospital Survey on Patient Safety Culture, October 2004 to July 2006 (Source: 2007 database, Agency for Healthcare Research and Quality, reported at level of Census subdivision)
- Number of registered nurse full-time equivalents per 1,000 adjusted patient days (Source: analysis of AHA Annual Survey data available through HCUP)
- Number of nursing full-time equivalents per 1,000 adjusted patient days, i.e., RNs, LPNs, and LVNs (Source: analysis of AHA Annual Survey data available through HCUP)
- Number of hospitalist full-time equivalents per 100,000 adjusted patient days (Source: analysis of AHA Annual Survey data available through HCUP)

Case mix

- Percent of discharges with Medicare as primary expected payer (Source: analysis of HCUP SID)
- Percent of discharges with Medicaid as primary expected payer (Source: analysis of HCUP SID)
- Percent of discharges with private insurance as primary expected payer (Source: analysis of HCUP SID)
- Percent of discharges considered uninsured (Source: analysis of HCUP SID)
- Births as percent of all discharges (Source: analysis of HCUP SID)
- Average number of operating room procedures per adult discharge (Source: analysis of HCUP SID)
- Medicare case-mix index (Source: analysis of Impact File for IPPS FY2006 Final Rule, Centers for Medicare and Medicaid Services, based on 2004 MedPAR data)

Other Hospital Characteristics

- Number of discharges per 100,000 population (Sources: analysis of HCUP SID; U.S. Census Bureau)

- Surgical DRGs per 1,000 adults (Sources: analysis of HCUP SID)
- Percent of discharges that were from hospitals with less than 100 beds (Source: analysis of HCUP SID)
- Percent of discharges that were from hospitals with greater than 300 beds (Source: analysis of HCUP SID)
- Percent of discharges that were from for-profit hospitals (Source: analysis of HCUP SID)
- Percent of discharges that were from teaching hospitals (Source: analysis of HCUP SID)
- Average length of stay (Source: analysis of HCUP SID)
- Average occupancy rate (Source: analysis of AHA Annual Survey data available through HCUP)

Coding Practices

- Percent of discharges with at least one E code (Source: analysis of HCUP SID)
- Average number of diagnosis fields used (Source: analysis of HCUP SID)
- Percent change from 2001 to 2004 in the average number of diagnosis fields used (Source: analysis of HCUP SID)

Other Characteristics

Socio-demographics

- Geographic region (Source: U.S. Census Bureau)
- Percent of population residing in rural areas (Source: State Profiles, Reforming the Health Care System, 2005 by AARP Public Policy Institute)
- Percent of population with total family income at or below the federal poverty level (Source: U.S. Census Bureau)
- Percent of population not White in 2004 and 2005 (Source: State Health Facts, Kaiser Family Foundation)
- Percent of population with college degree or higher (Source: U.S. Census Bureau)

Health-related Population Characteristics

- Percent of adults who are overweight or obese (Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Survey)
- Number of births per 1,000 females age 15 to 19 (Source: State Health Facts, Kaiser Family Foundation)
- Percent of adults who have been told by a doctor that they have pregnancy-related diabetes (Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Survey)
- Percent of adults who have been told by a doctor that they have diabetes (Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Survey)
- Percent of age 65+ population that has ever received a pneumococcal vaccination (Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Survey)
- Prevalence of emphysema among adults (Source: analysis of National Health Interview Survey)
- Percent of adults who currently smoke (Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Survey)

Physician Characteristics

- Number of generalist physicians per 100,000 population in 2003 (Source: State Profiles, Reforming the Health Care System, 2005 by AARP Public Policy Institute)
- Number of specialist physicians per 100,000 population in 2003 (Source: State Profiles, Reforming the Health Care System, 2005 by AARP Public Policy Institute)
- Number of serious disciplinary actions by State Boards per 1,000 physicians, 2002-2004 (Source: Ranking of State Medical Board Serious Disciplinary Actions: 2003-2005, Public Citizen Health Research Group)

APPENDIX D: PERCENT OF VARIATION IN STATE SNAPSHOT PSIs EXPLAINED BY FACTORS*

Potential Explanatory Factors	Death in low mortality DRGs (PSI 2)	Iatrogenic pneumothorax (PSI 6)	Selected infections due to medical care (PSI 7)	Postoperative sepsis (PSI 13)	Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)	Birth trauma – injury to neonate (PSI 17)	Obstetric trauma – vaginal delivery with instrument (PSI 18)	Obstetric trauma – vaginal delivery without instrument (PSI 19)	Obstetric trauma – cesarean delivery (PSI 20)
STATE POLICY CHARACTERISTICS									
Patient Safety Infrastructure									
Mandatory adverse event reporting, by year end 2004	5.8%	0.2%	1.0%	1.5%	6.9%	0.6%	0.4%	1.7%	0.1%
Proactive dissemination of information to public, by year end 2004	3.4%	7.3%	2.7%	0.1%	0.0%	1.6%	0.1%	3.3%	0.1%
Proactive feedback of information to providers, by year end 2004	0.9%	11.8%	0.4%	3.6%	0.6%	9.2%	0.4%	5.5%	0.0%
Patient safety center, by year end 2004	3.0%	4.0%	5.6%	0.8%	0.2%	13.1%	2.9%	8.7%	0.0%
Patient safety coalition, by year end 2004	0.0%	18.7%	2.6%	0.2%	0.5%	4.0%	0.5%	3.9%	3.7%
Mandatory adverse event reporting, by year end 2003	15.1%	0.1%	2.2%	0.1%	0.6%	6.2%	0.6%	1.3%	0.0%
Proactive dissemination of information to public, by year end 2003	3.9%	10.9%	4.5%	0.4%	0.0%	1.6%	0.1%	5.3%	1.2%
Proactive feedback of information to providers, by year end 2003	8.5%	10.8%	0.1%	0.7%	0.5%	0.8%	0.5%	5.8%	0.0%
Provider Regulation									
Prohibitions against mandatory nurse overtime, by year end 2004	0.8%	0.7%	0.1%	0.1%	3.0%	7.1%	2.2%	2.4%	0.1%
Prohibitions against mandatory nurse overtime, by year end 2003	0.3%	0.0%	0.7%	0.7%	3.7%	8.1%	0.2%	1.3%	1.3%
HOSPITAL CHARACTERISTICS									
Safety Processes									
% of hospitals in QIO project on surgical infection prevention	44.5%	3.5%	0.3%	11.4%	0.0%	26.9%	0.1%	1.5%	0.7%
% of hospitals complying with JCAHO goals for patient identification	3.3%	1.7%	0.0%	0.7%	1.9%	2.9%	0.3%	2.2%	13.6%
% of hospitals complying with JCAHO goals for communication	2.4%	0.0%	0.6%	4.5%	1.0%	0.7%	0.5%	0.9%	2.5%
% of hospitals complying with JCAHO goal for hand hygiene	0.8%	1.0%	0.9%	7.1%	3.0%	0.7%	4.0%	0.0%	0.2%
Institutional Culture									
% of hospitals with Nurse Magnet Certification	0.4%	0.2%	5.7%	0.1%	0.2%	0.6%	2.1%	0.1%	3.0%
% of Medicare pneumonia patients receiving recommended care	4.8%	2.1%	20.8%	2.7%	6.7%	0.0%	13.5%	10.7%	2.0%
% of AMI patients receiving recommended care	0.0%	5.4%	28.9%	0.9%	0.3%	1.0%	6.5%	0.8%	22.5%
% of staff responding positive on teamwork across unit	7.4%	0.9%	1.2%	15.1%	0.2%	0.8%	18.9%	0.4%	20.3%
% of staff responding positive on handoffs/ transitions	8.0%	1.0%	0.1%	17.7%	0.0%	0.7%	15.6%	0.3%	14.2%
% of staff responding positive on nonpunitive response to error	3.0%	0.1%	1.7%	16.3%	0.1%	0.2%	16.4%	0.1%	22.4%
% of hospitals that have never reported to National Practitioner Data Bank	0.9%	0.8%	22.6%	2.6%	1.3%	2.6%	2.2%	14.9%	4.3%
Staffing									
% of staff responding positive on staffing	0.5%	0.1%	4.3%	8.1%	0.5%	3.9%	8.8%	0.3%	20.9%
Registered nurse FTEs per 1000 inpatient days	23.3%	4.6%	9.1%	3.6%	0.2%	3.0%	0.8%	5.6%	7.0%
Nursing FTEs per 1000 inpatient days	21.7%	6.1%	4.2%	3.3%	0.4%	6.2%	4.5%	7.1%	16.3%
Hospitalist FTEs per 100,000 inpatient days	11.5%	1.5%	11.9%	0.0%	1.4%	0.4%	0.3%	3.0%	2.1%
Case mix									
% of discharges with Medicare as primary	26.3%	3.7%	8.6%	2.7%	1.5%	0.1%	0.5%	2.7%	0.3%
% of discharges with Medicaid as primary	0.7%	1.7%	2.1%	2.7%	2.9%	0.4%	25.8%	9.7%	1.3%
% of discharges with private insurance as primary	18.2%	2.2%	2.4%	0.9%	0.5%	0.1%	24.3%	2.1%	6.9%
% of discharges uninsured	1.3%	0.8%	1.9%	6.0%	2.5%	0.3%	16.5%	7.2%	17.0%
Births as share of discharges	27.4%	2.9%	0.0%	0.0%	2.0%	2.1%	1.1%	1.9%	0.1%
Average number of operating room procedures per adult discharge	19.0%	17.5%	3.1%	0.6%	1.5%	1.6%	6.3%	0.7%	6.5%
Medicare case-mix index	11.5%	1.0%	0.7%	1.7%	0.5%	5.6%	28.4%	9.7%	3.8%

Potential Explanatory Factors	Death in low mortality DRGs (PSI 2)	Iatrogenic pneumothorax (PSI 6)	Selected infections due to medical care (PSI 7)	Postoperative sepsis (PSI 13)	Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)	Birth trauma – injury to neonate (PSI 17)	Obstetric trauma – vaginal delivery with instrument (PSI 18)	Obstetric trauma – vaginal delivery without instrument (PSI 19)	Obstetric trauma – cesarean delivery (PSI 20)
Other Hospital Characteristics									
Discharges per 100,000 population	5.2%	2.5%	1.5%	4.9%	5.0%	0.5%	21.5%	0.3%	21.8%
Surgeries per 1,000 adults	19.5%	15.5%	2.2%	3.8%	0.8%	5.0%	5.5%	0.8%	6.4%
% of discharges from hospitals with < 100 beds	3.9%	1.1%	36.4%	15.0%	0.0%	0.3%	11.8%	1.3%	6.9%
% of discharges from hospitals with > 300 beds	3.0%	1.7%	3.8%	9.4%	0.4%	2.2%	0.3%	0.0%	1.5%
% of discharges from for-profit hospitals	0.8%	0.3%	6.5%	7.6%	2.4%	8.6%	17.4%	8.4%	29.6%
% of discharges from teaching hospitals	1.5%	0.3%	7.5%	1.0%	0.0%	1.1%	5.7%	0.1%	22.2%
Average length of stay	7.0%	2.7%	3.2%	0.0%	0.3%	0.0%	8.5%	0.0%	2.1%
Occupancy rate	0.0%	1.1%	49.5%	6.0%	0.4%	6.8%	6.4%	3.8%	0.6%
CODING									
Percent of discharges with at least one E-code	5.4%	15.1%	9.5%	0.3%	0.4%	13.6%	6.2%	0.1%	31.0%
Average number of diagnosis fields used in 2004	13.2%	1.5%	14.1%	18.4%	0.1%	17.3%	0.2%	0.0%	3.7%
% change in number of diagnosis fields used from 2001 to 2004	7.8%	1.5%	9.7%	15.8%	0.0%	18.8%	1.2%	0.0%	0.1%
OTHER CHARACTERISTICS									
Socio-demographics									
Census region									
West census region (compared to South census region)	15.7%	8.5%	10.4%	0.1%	0.1%	1.1%	1.9%	3.6%	0.1%
Midwest census region (compared to South census region)	5.4%	3.0%	24.3%	3.6%	1.0%	2.7%	19.4%	15.7%	0.0%
Northeast census region (compared to South census region)	3.8%	0.1%	8.7%	2.1%	0.0%	1.6%	4.2%	0.8%	23.1%
% of population residing in a rural area	16.2%	5.0%	39.9%	9.2%	0.9%	0.0%	5.8%	10.5%	3.1%
% of population with income below poverty	0.2%	0.0%	1.9%	1.3%	0.1%	12.1%	32.4%	4.1%	24.1%
% of population that is non-white	2.3%	0.3%	14.6%	4.2%	0.6%	3.6%	14.4%	0.1%	11.8%
% of population with college degree	0.9%	1.4%	12.0%	1.1%	6.3%	12.6%	11.2%	1.2%	20.4%
Health-related Population Characteristics									
% of population that is overweight or obese	3.5%	13.4%	21.1%	0.3%	2.1%	5.2%	5.5%	7.6%	27.8%
Teen birth rate	1.4%	0.5%	0.0%	6.2%	0.3%	8.8%	22.9%	0.5%	37.1%
% of population diagnosed with pregnancy-related diabetes	0.4%	0.0%	29.9%	8.9%	2.7%	1.5%	1.4%	1.9%	1.4%
% of population diagnosed with diabetes	17.9%	6.8%	0.9%	2.9%	0.9%	0.2%	21.8%	0.1%	18.6%
% of 65+ population that has received pneumococcal vaccination	0.9%	5.3%	2.6%	15.6%	2.0%	0.0%	12.1%	0.0%	16.6%
% of population with emphesyma	20.7%	0.0%	0.0%	5.4%	2.8%	0.4%	0.4%	2.1%	4.1%
% of population that currently smokes tobacco	16.1%	1.2%	0.4%	0.2%	4.6%	1.5%	4.8%	3.7%	0.9%
Physician Characteristics									
Generalists physicians per 100,000 population	0.4%	0.0%	32.3%	17.8%	6.0%	0.5%	10.0%	6.0%	8.9%
Specialist physicians per 100,000 population	3.4%	2.6%	17.0%	0.4%	0.9%	29.5%	0.5%	1.5%	22.5%
Serious Board disciplinary actions per 1,000 physicians	0.7%	0.6%	0.5%	6.6%	3.3%	2.9%	1.0%	1.4%	1.1%

* Yellow shading indicates positive association, statistically significant at p<0.05; blue shading indicates negative association, statistically significant at p<0.05; no shading indicates no statistically significant association.

APPENDIX E: RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION IN PSIs

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: COMPLICATIONS OF ANESTHESIA (PSI 1)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.7%
Proactive dissemination of information to public, by year end 2004	NS	0.7%
Proactive feedback of information to providers, by year end 2004	NS	0.8%
Patient safety center, by year end 2004	NS	0.1%
Patient safety coalition, by year end 2004	NS	0.5%
Mandatory adverse event reporting, by year end 2003	NS	4.6%
Proactive dissemination of information to public, by year end 2003	NS	0.7%
Proactive feedback of information to providers, by year end 2003	NS	0.0%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.0%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	1.0%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	2.1%
% of hospitals complying with JCAHO goals for patient identification	—	20.9%
% of hospitals complying with JCAHO goals for communication	NS	9.0%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.9%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.0%
% of Medicare pneumonia patients receiving recommended care	NS	7.8%
% of AMI patients receiving recommended care	NS	5.9%
% of staff responding positive on teamwork across unit	NS	8.8%
% of staff responding positive on handoffs/ transitions	NS	8.7%
% of staff responding positive on nonpunitive response to error	NS	7.9%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.3%
Staffing		
% of staff responding positive on staffing	NS	2.5%
Registered nurse FTEs per 1000 inpatient days	NS	0.2%
Nursing FTEs per 1000 inpatient days	NS	1.7%
Hospitalist FTEs per 100,000 inpatient days	NS	0.3%
Case mix		
% of discharges with Medicare as primary	NS	0.1%
% of discharges with Medicaid as primary	NS	7.4%
% of discharges with private insurance as primary	NS	9.1%
% of discharges uninsured	NS	3.3%
Births as share of discharges	NS	4.5%
Average number of operating room procedures per adult discharge	NS	4.5%
Medicare case-mix index	NS	3.3%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	11.6%
Surgeries per 1,000 adults	NS	3.9%
% of discharges from hospitals with < 100 beds	NS	4.5%
% of discharges from hospitals with > 300 beds	NS	8.4%
% of discharges from for-profit hospitals	—	12.7%
% of discharges from teaching hospitals	NS	0.2%
Average length of stay	NS	3.7%
Occupancy rate	NS	2.2%

CODING		
Percent of discharges with at least one E-code	NS	0.5%
Average number of diagnosis fields used in 2004	NS	3.0%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.1%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.0%
Midwest census region (compared to South census region)	NS	6.5%
Northeast census region (compared to South census region)	NS	0.1%
% of population residing in a rural area	NS	1.4%
% of population with income below poverty	—	26.6%
% of population that is non-white	NS	0.2%
% of population with college degree	NS	7.2%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	6.7%
Teen birth rate	—	16.7%
% of population diagnosed with pregnancy-related diabetes*	NS	0.3%
% of population diagnosed with diabetes*	—	14.7%
% of 65+ population that has received pneumococcal vaccination*	+	14.2%
% of population with emphesyma	NS	1.2%
% of population that currently smokes tobacco*	NS	7.5%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	1.8%
Specialist physicians per 100,000 population	NS	0.0%
Serious Board disciplinary actions per 1,000 physicians	NS	0.2%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: DEATH IN LOW MORTALITY DRGS (PSI 2)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	5.8%
Proactive dissemination of information to public, by year end 2004	NS	3.4%
Proactive feedback of information to providers, by year end 2004	NS	0.9%
Patient safety center, by year end 2004	NS	3.0%
Patient safety coalition, by year end 2004	NS	0.0%
Mandatory adverse event reporting, by year end 2003	—	15.1%
Proactive dissemination of information to public, by year end 2003	NS	3.9%
Proactive feedback of information to providers, by year end 2003	NS	8.5%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.8%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	+	44.5%
% of hospitals complying with JCAHO goals for patient identification	NS	3.3%
% of hospitals complying with JCAHO goals for communication	NS	2.4%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.8%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.4%
% of Medicare pneumonia patients receiving recommended care	NS	4.8%
% of AMI patients receiving recommended care	NS	0.0%
% of staff responding positive on teamwork across unit	NS	7.4%
% of staff responding positive on handoffs/ transitions	NS	8.0%
% of staff responding positive on nonpunitive response to error	NS	3.0%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.9%
Staffing		
% of staff responding positive on staffing	NS	0.5%
Registered nurse FTEs per 1000 inpatient days	—	23.3%
Nursing FTEs per 1000 inpatient days	—	21.7%
Hospitalist FTEs per 100,000 inpatient days	—	11.5%
Case mix		
% of discharges with Medicare as primary	+	26.3%
% of discharges with Medicaid as primary	NS	0.7%
% of discharges with private insurance as primary	—	18.2%
% of discharges uninsured	NS	1.3%
Births as share of discharges	—	27.4%
Average number of operating room procedures per adult discharge	—	19.0%
Medicare case-mix index	—	11.5%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	5.2%
Surgeries per 1,000 adults	—	19.5%
% of discharges from hospitals with < 100 beds	NS	3.9%
% of discharges from hospitals with > 300 beds	NS	3.0%
% of discharges from for-profit hospitals	NS	0.8%
% of discharges from teaching hospitals	NS	1.5%
Average length of stay	NS	7.0%
Occupancy rate	NS	0.0%

CODING		
Percent of discharges with at least one E-code	NS	5.4%
Average number of diagnosis fields used in 2004	+	13.2%
% change in number of diagnosis fields used from 2001 to 2004*	NS	7.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	—	15.7%
Midwest census region (compared to South census region)	NS	5.4%
Northeast census region (compared to South census region)	NS	3.8%
% of population residing in a rural area	+	16.2%
% of population with income below poverty	NS	0.2%
% of population that is non-white	NS	2.3%
% of population with college degree	NS	0.9%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	3.5%
Teen birth rate	NS	1.4%
% of population diagnosed with pregnancy-related diabetes*	NS	0.4%
% of population diagnosed with diabetes*	+	17.9%
% of 65+ population that has received pneumococcal vaccination*	NS	0.9%
% of population with emphesyma	+	20.7%
% of population that currently smokes tobacco*	+	16.1%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	0.4%
Specialist physicians per 100,000 population	NS	3.4%
Serious Board disciplinary actions per 1,000 physicians	NS	0.7%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: FAILURE TO RESCUE (PSI 4)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.0%
Proactive dissemination of information to public, by year end 2004	NS	0.0%
Proactive feedback of information to providers, by year end 2004	NS	0.5%
Patient safety center, by year end 2004	NS	3.1%
Patient safety coalition, by year end 2004	NS	3.8%
Mandatory adverse event reporting, by year end 2003	NS	2.8%
Proactive dissemination of information to public, by year end 2003	NS	0.0%
Proactive feedback of information to providers, by year end 2003	NS	0.6%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.4%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	2.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	2.0%
% of hospitals complying with JCAHO goals for patient identification	NS	1.5%
% of hospitals complying with JCAHO goals for communication	NS	0.4%
% of hospitals complying with JCAHO goal for hand hygiene	NS	6.7%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	5.7%
% of Medicare pneumonia patients receiving recommended care	—	11.1%
% of AMI patients receiving recommended care	NS	2.5%
% of staff responding positive on teamwork across unit	NS	8.8%
% of staff responding positive on handoffs/ transitions	NS	8.4%
% of staff responding positive on nonpunitive response to error	—	15.1%
% of hospitals that have never reported to National Practitioner Data Bank	—	13.8%
Staffing		
% of staff responding positive on staffing	—	20.7%
Registered nurse FTEs per 1000 inpatient days	NS	1.2%
Nursing FTEs per 1000 inpatient days	NS	1.5%
Hospitalist FTEs per 100,000 inpatient days	NS	1.6%
Case mix		
% of discharges with Medicare as primary	NS	1.7%
% of discharges with Medicaid as primary	NS	8.8%
% of discharges with private insurance as primary	NS	0.4%
% of discharges uninsured	NS	2.7%
Births as share of discharges	NS	0.1%
Average number of operating room procedures per adult discharge	NS	3.1%
Medicare case-mix index	NS	1.5%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	1.9%
Surgeries per 1,000 adults	NS	2.9%
% of discharges from hospitals with < 100 beds	NS	6.6%
% of discharges from hospitals with > 300 beds	NS	0.4%
% of discharges from for-profit hospitals	NS	0.0%
% of discharges from teaching hospitals	NS	3.9%
Average length of stay	+	38.8%
Occupancy rate	+	27.5%

CODING		
Percent of discharges with at least one E-code	NS	6.2%
Average number of diagnosis fields used in 2004	NS	0.0%
% change in number of diagnosis fields used from 2001 to 2004*	NS	8.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.9%
Midwest census region (compared to South census region)	—	21.3%
Northeast census region (compared to South census region)	+	19.7%
% of population residing in a rural area	NS	5.4%
% of population with income below poverty	NS	0.6%
% of population that is non-white	+	28.4%
% of population with college degree	NS	4.0%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	1.4%
Teen birth rate	NS	2.2%
% of population diagnosed with pregnancy-related diabetes*	+	36.6%
% of population diagnosed with diabetes*	NS	1.3%
% of 65+ population that has received pneumococcal vaccination*	NS	0.0%
% of population with emphesyma	NS	2.2%
% of population that currently smokes tobacco*	NS	1.7%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	9.8%
Specialist physicians per 100,000 population	+	16.2%
Serious Board disciplinary actions per 1,000 physicians	—	19.3%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: FOREIGN BODY LEFT IN DURING PROCEDURE (PSI 5)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.1%
Proactive dissemination of information to public, by year end 2004	NS	0.0%
Proactive feedback of information to providers, by year end 2004	NS	1.0%
Patient safety center, by year end 2004	NS	3.1%
Patient safety coalition, by year end 2004	+	11.8%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	0.1%
Proactive feedback of information to providers, by year end 2003	NS	0.0%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	5.6%
Prohibitions against mandatory nurse overtime, by year end 2003	+	12.0%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.5%
% of hospitals complying with JCAHO goals for patient identification	NS	0.8%
% of hospitals complying with JCAHO goals for communication	NS	0.3%
% of hospitals complying with JCAHO goal for hand hygiene	NS	1.1%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.9%
% of Medicare pneumonia patients receiving recommended care	NS	2.2%
% of AMI patients receiving recommended care	+	25.0%
% of staff responding positive on teamwork across unit	NS	6.3%
% of staff responding positive on handoffs/ transitions	NS	5.3%
% of staff responding positive on nonpunitive response to error	NS	9.9%
% of hospitals that have never reported to National Practitioner Data Bank	NS	1.1%
Staffing		
% of staff responding positive on staffing	NS	3.4%
Registered nurse FTEs per 1000 inpatient days	NS	10.0%
Nursing FTEs per 1000 inpatient days	NS	2.6%
Hospitalist FTEs per 100,000 inpatient days	NS	5.3%
Case mix		
% of discharges with Medicare as primary	NS	9.2%
% of discharges with Medicaid as primary	NS	0.8%
% of discharges with private insurance as primary	+	25.9%
% of discharges uninsured	—	15.1%
Births as share of discharges	NS	4.0%
Average number of operating room procedures per adult discharge	+	42.5%
Medicare case-mix index	+	25.1%
Other Hospital Characteristics		
Discharges per 100,000 population	—	40.5%
Surgeries per 1,000 adults	+	34.8%
% of discharges from hospitals with < 100 beds	NS	1.1%
% of discharges from hospitals with > 300 beds	NS	0.8%
% of discharges from for-profit hospitals	NS	10.4%
% of discharges from teaching hospitals	NS	5.4%
Average length of stay	—	20.2%
Occupancy rate	NS	0.1%

CODING		
Percent of discharges with at least one E-code	+	15.6%
Average number of diagnosis fields used in 2004	NS	6.6%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.1%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	8.5%
Midwest census region (compared to South census region)	NS	2.8%
Northeast census region (compared to South census region)	NS	0.0%
% of population residing in a rural area	NS	1.6%
% of population with income below poverty	—	20.8%
% of population that is non-white	NS	2.5%
% of population with college degree	+	17.0%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	17.0%
Teen birth rate	—	16.4%
% of population diagnosed with pregnancy-related diabetes*	NS	5.3%
% of population diagnosed with diabetes*	—	18.0%
% of 65+ population that has received pneumococcal vaccination*	+	24.2%
% of population with emphesyma	NS	0.0%
% of population that currently smokes tobacco*	NS	4.1%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	9.0%
Specialist physicians per 100,000 population	NS	4.9%
Serious Board disciplinary actions per 1,000 physicians	NS	2.9%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: IATROGENIC PNEUMOTHORAX (PSI 6)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.2%
Proactive dissemination of information to public, by year end 2004	NS	7.3%
Proactive feedback of information to providers, by year end 2004	+	11.8%
Patient safety center, by year end 2004	NS	4.0%
Patient safety coalition, by year end 2004	+	18.7%
Mandatory adverse event reporting, by year end 2003	NS	0.1%
Proactive dissemination of information to public, by year end 2003	+	10.9%
Proactive feedback of information to providers, by year end 2003	+	10.8%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.7%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.0%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	3.5%
% of hospitals complying with JCAHO goals for patient identification	NS	1.7%
% of hospitals complying with JCAHO goals for communication	NS	0.0%
% of hospitals complying with JCAHO goal for hand hygiene	NS	1.0%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.2%
% of Medicare pneumonia patients receiving recommended care	NS	2.1%
% of AMI patients receiving recommended care	NS	5.4%
% of staff responding positive on teamwork across unit	NS	0.9%
% of staff responding positive on handoffs/ transitions	NS	1.0%
% of staff responding positive on nonpunitive response to error	NS	0.1%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.8%
Staffing		
% of staff responding positive on staffing	NS	0.1%
Registered nurse FTEs per 1000 inpatient days	NS	4.6%
Nursing FTEs per 1000 inpatient days	NS	6.1%
Hospitalist FTEs per 100,000 inpatient days	NS	1.5%
Case mix		
% of discharges with Medicare as primary	NS	3.7%
% of discharges with Medicaid as primary	NS	1.7%
% of discharges with private insurance as primary	NS	2.2%
% of discharges uninsured	NS	0.8%
Births as share of discharges	NS	2.9%
Average number of operating room procedures per adult discharge	+	17.5%
Medicare case-mix index	NS	1.0%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	2.5%
Surgeries per 1,000 adults	+	15.5%
% of discharges from hospitals with < 100 beds	NS	1.1%
% of discharges from hospitals with > 300 beds	NS	1.7%
% of discharges from for-profit hospitals	NS	0.3%
% of discharges from teaching hospitals	NS	0.3%
Average length of stay	NS	2.7%
Occupancy rate	NS	1.1%

CODING		
Percent of discharges with at least one E-code	+	15.1%
Average number of diagnosis fields used in 2004	NS	1.5%
% change in number of diagnosis fields used from 2001 to 2004*	NS	1.5%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	8.5%
Midwest census region (compared to South census region)	NS	3.0%
Northeast census region (compared to South census region)	NS	0.1%
% of population residing in a rural area	NS	5.0%
% of population with income below poverty	NS	0.0%
% of population that is non-white	NS	0.3%
% of population with college degree	NS	1.4%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	13.4%
Teen birth rate	NS	0.5%
% of population diagnosed with pregnancy-related diabetes*	NS	0.0%
% of population diagnosed with diabetes*	NS	6.8%
% of 65+ population that has received pneumococcal vaccination*	NS	5.3%
% of population with emphesyma	NS	0.0%
% of population that currently smokes tobacco*	NS	1.2%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	0.0%
Specialist physicians per 100,000 population	NS	2.6%
Serious Board disciplinary actions per 1,000 physicians	NS	0.6%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: SELECTED INFECTIONS DUE TO MEDICAL CARE (PSI 7)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.0%
Proactive dissemination of information to public, by year end 2004	NS	2.7%
Proactive feedback of information to providers, by year end 2004	NS	0.4%
Patient safety center, by year end 2004	NS	5.6%
Patient safety coalition, by year end 2004	NS	2.6%
Mandatory adverse event reporting, by year end 2003	NS	2.2%
Proactive dissemination of information to public, by year end 2003	NS	4.5%
Proactive feedback of information to providers, by year end 2003	NS	0.1%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.1%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.7%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.3%
% of hospitals complying with JCAHO goals for patient identification	NS	0.0%
% of hospitals complying with JCAHO goals for communication	NS	0.6%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.9%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	5.7%
% of Medicare pneumonia patients receiving recommended care	—	20.8%
% of AMI patients receiving recommended care	+	28.9%
% of staff responding positive on teamwork across unit	NS	1.2%
% of staff responding positive on handoffs/ transitions	NS	0.1%
% of staff responding positive on nonpunitive response to error	NS	1.7%
% of hospitals that have never reported to National Practitioner Data Bank	—	22.6%
Staffing		
% of staff responding positive on staffing	NS	4.3%
Registered nurse FTEs per 1000 inpatient days	NS	9.1%
Nursing FTEs per 1000 inpatient days	NS	4.2%
Hospitalist FTEs per 100,000 inpatient days	+	11.9%
Case mix		
% of discharges with Medicare as primary	NS	8.6%
% of discharges with Medicaid as primary	NS	2.1%
% of discharges with private insurance as primary	NS	2.4%
% of discharges uninsured	NS	1.9%
Births as share of discharges	NS	0.0%
Average number of operating room procedures per adult discharge	NS	3.1%
Medicare case-mix index	NS	0.7%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	1.5%
Surgeries per 1,000 adults	NS	2.2%
% of discharges from hospitals with < 100 beds	—	36.4%
% of discharges from hospitals with > 300 beds	NS	3.8%
% of discharges from for-profit hospitals	NS	6.5%
% of discharges from teaching hospitals	NS	7.5%
Average length of stay	NS	3.2%
Occupancy rate	+	49.5%

CODING		
Percent of discharges with at least one E-code	NS	9.5%
Average number of diagnosis fields used in 2004	+	14.1%
% change in number of diagnosis fields used from 2001 to 2004*	NS	9.7%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	10.4%
Midwest census region (compared to South census region)	—	24.3%
Northeast census region (compared to South census region)	NS	8.7%
% of population residing in a rural area	—	39.9%
% of population with income below poverty	NS	1.9%
% of population that is non-white	+	14.6%
% of population with college degree	+	12.0%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	21.1%
Teen birth rate	NS	0.0%
% of population diagnosed with pregnancy-related diabetes*	+	29.9%
% of population diagnosed with diabetes*	NS	0.9%
% of 65+ population that has received pneumococcal vaccination*	NS	2.6%
% of population with emphesyma	NS	0.0%
% of population that currently smokes tobacco*	NS	0.4%
Physician Characteristics		
Generalists physicians per 100,000 population	—	32.3%
Specialist physicians per 100,000 population	+	17.0%
Serious Board disciplinary actions per 1,000 physicians	NS	0.5%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE HEMORRHAGE OR HEMATOMA (PSI 9)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.0%
Proactive dissemination of information to public, by year end 2004	NS	0.1%
Proactive feedback of information to providers, by year end 2004	NS	5.5%
Patient safety center, by year end 2004	NS	2.7%
Patient safety coalition, by year end 2004	NS	3.4%
Mandatory adverse event reporting, by year end 2003	NS	2.5%
Proactive dissemination of information to public, by year end 2003	NS	0.1%
Proactive feedback of information to providers, by year end 2003	NS	2.5%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.5%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	10.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	1.6%
% of hospitals complying with JCAHO goals for patient identification	NS	5.8%
% of hospitals complying with JCAHO goals for communication	NS	4.1%
% of hospitals complying with JCAHO goal for hand hygiene	NS	1.2%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.1%
% of Medicare pneumonia patients receiving recommended care	NS	2.0%
% of AMI patients receiving recommended care	NS	3.8%
% of staff responding positive on teamwork across unit	—	11.0%
% of staff responding positive on handoffs/ transitions	NS	9.0%
% of staff responding positive on nonpunitive response to error	NS	9.7%
% of hospitals that have never reported to National Practitioner Data Bank	NS	5.0%
Staffing		
% of staff responding positive on staffing	NS	2.7%
Registered nurse FTEs per 1000 inpatient days	NS	4.0%
Nursing FTEs per 1000 inpatient days	NS	1.7%
Hospitalist FTEs per 100,000 inpatient days	NS	0.9%
Case mix		
% of discharges with Medicare as primary	—	16.1%
% of discharges with Medicaid as primary	NS	1.2%
% of discharges with private insurance as primary	+	15.3%
% of discharges uninsured	NS	3.6%
Births as share of discharges	+	14.8%
Average number of operating room procedures per adult discharge	+	28.6%
Medicare case-mix index	NS	3.3%
Other Hospital Characteristics		
Discharges per 100,000 population	—	33.1%
Surgeries per 1,000 adults	+	19.3%
% of discharges from hospitals with < 100 beds	NS	5.5%
% of discharges from hospitals with > 300 beds	NS	8.2%
% of discharges from for-profit hospitals	NS	2.3%
% of discharges from teaching hospitals	NS	0.1%
Average length of stay	—	12.3%
Occupancy rate	NS	0.3%

CODING		
Percent of discharges with at least one E-code	+	23.3%
Average number of diagnosis fields used in 2004	NS	3.9%
% change in number of diagnosis fields used from 2001 to 2004*	NS	8.4%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	+	21.1%
Midwest census region (compared to South census region)	NS	2.3%
Northeast census region (compared to South census region)	NS	1.1%
% of population residing in a rural area	NS	0.1%
% of population with income below poverty	—	16.2%
% of population that is non-white	NS	0.0%
% of population with college degree	+	14.3%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	26.7%
Teen birth rate	NS	10.4%
% of population diagnosed with pregnancy-related diabetes*	NS	0.8%
% of population diagnosed with diabetes*	—	28.4%
% of 65+ population that has received pneumococcal vaccination*	NS	9.5%
% of population with emphesyma	NS	0.6%
% of population that currently smokes tobacco*	NS	8.4%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	3.5%
Specialist physicians per 100,000 population	NS	8.0%
Serious Board disciplinary actions per 1,000 physicians	NS	1.2%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE PHYSIOLOGIC AND METABOLIC DERANGEMENTS (PSI 10)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.0%
Proactive dissemination of information to public, by year end 2004	NS	0.5%
Proactive feedback of information to providers, by year end 2004	NS	3.1%
Patient safety center, by year end 2004	NS	0.1%
Patient safety coalition, by year end 2004	NS	6.7%
Mandatory adverse event reporting, by year end 2003	NS	2.4%
Proactive dissemination of information to public, by year end 2003	NS	0.8%
Proactive feedback of information to providers, by year end 2003	NS	2.7%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.2%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	1.0%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.1%
% of hospitals complying with JCAHO goals for patient identification	NS	0.2%
% of hospitals complying with JCAHO goals for communication	NS	3.2%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.9%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.2%
% of Medicare pneumonia patients receiving recommended care	NS	10.9%
% of AMI patients receiving recommended care	NS	1.4%
% of staff responding positive on teamwork across unit	NS	1.6%
% of staff responding positive on handoffs/ transitions	NS	2.5%
% of staff responding positive on nonpunitive response to error	NS	1.5%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.5%
Staffing		
% of staff responding positive on staffing	NS	0.5%
Registered nurse FTEs per 1000 inpatient days	NS	0.3%
Nursing FTEs per 1000 inpatient days	NS	0.0%
Hospitalist FTEs per 100,000 inpatient days	NS	0.9%
Case mix		
% of discharges with Medicare as primary	NS	2.8%
% of discharges with Medicaid as primary	NS	5.2%
% of discharges with private insurance as primary	NS	0.6%
% of discharges uninsured	NS	2.7%
Births as share of discharges	NS	1.2%
Average number of operating room procedures per adult discharge	NS	2.7%
Medicare case-mix index	NS	1.1%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	1.4%
Surgeries per 1,000 adults	NS	6.6%
% of discharges from hospitals with < 100 beds	NS	9.5%
% of discharges from hospitals with > 300 beds	NS	4.1%
% of discharges from for-profit hospitals	NS	8.8%
% of discharges from teaching hospitals	NS	0.0%
Average length of stay	+	14.3%
Occupancy rate	NS	6.4%

CODING		
Percent of discharges with at least one E-code	NS	0.7%
Average number of diagnosis fields used in 2004	+	21.0%
% change in number of diagnosis fields used from 2001 to 2004*	+	35.4%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	0.8%
Midwest census region (compared to South census region)	NS	0.1%
Northeast census region (compared to South census region)	NS	0.1%
% of population residing in a rural area	—	12.3%
% of population with income below poverty	NS	0.3%
% of population that is non-white	+	15.6%
% of population with college degree	NS	0.1%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	0.1%
Teen birth rate	NS	2.2%
% of population diagnosed with pregnancy-related diabetes*	+	15.6%
% of population diagnosed with diabetes*	NS	1.9%
% of 65+ population that has received pneumococcal vaccination*	NS	5.2%
% of population with emphesyma	NS	0.2%
% of population that currently smokes tobacco*	NS	0.6%
Physician Characteristics		
Generalists physicians per 100,000 population	—	14.8%
Specialist physicians per 100,000 population	NS	0.8%
Serious Board disciplinary actions per 1,000 physicians	NS	0.0%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE RESPIRATORY FAILURE (PSI 11)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.7%
Proactive dissemination of information to public, by year end 2004	NS	5.3%
Proactive feedback of information to providers, by year end 2004	NS	1.0%
Patient safety center, by year end 2004	NS	0.0%
Patient safety coalition, by year end 2004	NS	0.8%
Mandatory adverse event reporting, by year end 2003	NS	1.5%
Proactive dissemination of information to public, by year end 2003	NS	3.9%
Proactive feedback of information to providers, by year end 2003	NS	0.1%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	6.2%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	6.9%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.3%
% of hospitals complying with JCAHO goals for patient identification	NS	0.3%
% of hospitals complying with JCAHO goals for communication	NS	5.0%
% of hospitals complying with JCAHO goal for hand hygiene	—	15.8%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	1.6%
% of Medicare pneumonia patients receiving recommended care	NS	5.2%
% of AMI patients receiving recommended care	NS	5.0%
% of staff responding positive on teamwork across unit	+	18.6%
% of staff responding positive on handoffs/ transitions	+	20.9%
% of staff responding positive on nonpunitive response to error	+	19.6%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.0%
Staffing		
% of staff responding positive on staffing	+	11.7%
Registered nurse FTEs per 1000 inpatient days	NS	0.2%
Nursing FTEs per 1000 inpatient days	NS	0.0%
Hospitalist FTEs per 100,000 inpatient days	NS	0.9%
Case mix		
% of discharges with Medicare as primary	NS	0.0%
% of discharges with Medicaid as primary	NS	6.5%
% of discharges with private insurance as primary	NS	9.7%
% of discharges uninsured	NS	4.5%
Births as share of discharges	NS	3.7%
Average number of operating room procedures per adult discharge	NS	5.1%
Medicare case-mix index	NS	6.4%
Other Hospital Characteristics		
Discharges per 100,000 population	+	18.4%
Surgeries per 1,000 adults	NS	9.5%
% of discharges from hospitals with < 100 beds	—	18.6%
% of discharges from hospitals with > 300 beds	+	13.8%
% of discharges from for-profit hospitals	+	13.5%
% of discharges from teaching hospitals	NS	0.7%
Average length of stay	+	12.2%
Occupancy rate	NS	5.1%

CODING		
Percent of discharges with at least one E-code	NS	0.1%
Average number of diagnosis fields used in 2004	+	18.7%
% change in number of diagnosis fields used from 2001 to 2004*	NS	5.0%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.4%
Midwest census region (compared to South census region)	NS	0.2%
Northeast census region (compared to South census region)	NS	4.9%
% of population residing in a rural area	NS	5.9%
% of population with income below poverty	NS	7.1%
% of population that is non-white	NS	5.2%
% of population with college degree	NS	2.3%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	5.1%
Teen birth rate	+	16.2%
% of population diagnosed with pregnancy-related diabetes*	NS	1.1%
% of population diagnosed with diabetes*	+	13.4%
% of 65+ population that has received pneumococcal vaccination*	—	19.0%
% of population with emphesyma	NS	0.3%
% of population that currently smokes tobacco*	+	12.7%
Physician Characteristics		
Generalists physicians per 100,000 population	—	18.8%
Specialist physicians per 100,000 population	NS	0.2%
Serious Board disciplinary actions per 1,000 physicians	+	11.9%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE SEPSIS (PSI 13)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.5%
Proactive dissemination of information to public, by year end 2004	NS	0.1%
Proactive feedback of information to providers, by year end 2004	NS	3.6%
Patient safety center, by year end 2004	NS	0.8%
Patient safety coalition, by year end 2004	NS	0.2%
Mandatory adverse event reporting, by year end 2003	NS	0.1%
Proactive dissemination of information to public, by year end 2003	NS	0.4%
Proactive feedback of information to providers, by year end 2003	NS	0.7%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.1%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.7%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	11.4%
% of hospitals complying with JCAHO goals for patient identification	NS	0.7%
% of hospitals complying with JCAHO goals for communication	NS	4.5%
% of hospitals complying with JCAHO goal for hand hygiene	NS	7.1%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.1%
% of Medicare pneumonia patients receiving recommended care	NS	2.7%
% of AMI patients receiving recommended care	NS	0.9%
% of staff responding positive on teamwork across unit	+	15.1%
% of staff responding positive on handoffs/ transitions	+	17.7%
% of staff responding positive on nonpunitive response to error	+	16.3%
% of hospitals that have never reported to National Practitioner Data Bank	NS	2.6%
Staffing		
% of staff responding positive on staffing	NS	8.1%
Registered nurse FTEs per 1000 inpatient days	NS	3.6%
Nursing FTEs per 1000 inpatient days	NS	3.3%
Hospitalist FTEs per 100,000 inpatient days	NS	0.0%
Case mix		
% of discharges with Medicare as primary	NS	2.7%
% of discharges with Medicaid as primary	NS	2.7%
% of discharges with private insurance as primary	NS	0.9%
% of discharges uninsured	NS	6.0%
Births as share of discharges	NS	0.0%
Average number of operating room procedures per adult discharge	NS	0.6%
Medicare case-mix index	NS	1.7%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	4.9%
Surgeries per 1,000 adults	NS	3.8%
% of discharges from hospitals with < 100 beds	—	15.0%
% of discharges from hospitals with > 300 beds	NS	9.4%
% of discharges from for-profit hospitals	NS	7.6%
% of discharges from teaching hospitals	NS	1.0%
Average length of stay	NS	0.0%
Occupancy rate	NS	6.0%

CODING		
Percent of discharges with at least one E-code	NS	0.3%
Average number of diagnosis fields used in 2004	+	18.4%
% change in number of diagnosis fields used from 2001 to 2004*	+	15.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	0.1%
Midwest census region (compared to South census region)	NS	3.6%
Northeast census region (compared to South census region)	NS	2.1%
% of population residing in a rural area	NS	9.2%
% of population with income below poverty	NS	1.3%
% of population that is non-white	NS	4.2%
% of population with college degree	NS	1.1%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	0.3%
Teen birth rate	NS	6.2%
% of population diagnosed with pregnancy-related diabetes*	NS	8.9%
% of population diagnosed with diabetes*	NS	2.9%
% of 65+ population that has received pneumococcal vaccination*	—	15.6%
% of population with emphesyma	NS	5.4%
% of population that currently smokes tobacco*	NS	0.2%
Physician Characteristics		
Generalists physicians per 100,000 population	—	17.8%
Specialist physicians per 100,000 population	NS	0.4%
Serious Board disciplinary actions per 1,000 physicians	NS	6.6%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE WOUND DEHISCENCE IN ABDOMINOPELVIC SURGERY PATIENTS (PSI 14)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	6.9%
Proactive dissemination of information to public, by year end 2004	NS	0.0%
Proactive feedback of information to providers, by year end 2004	NS	0.6%
Patient safety center, by year end 2004	NS	0.2%
Patient safety coalition, by year end 2004	NS	0.5%
Mandatory adverse event reporting, by year end 2003	NS	0.6%
Proactive dissemination of information to public, by year end 2003	NS	0.0%
Proactive feedback of information to providers, by year end 2003	NS	0.5%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	3.0%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	3.7%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.0%
% of hospitals complying with JCAHO goals for patient identification	NS	1.9%
% of hospitals complying with JCAHO goals for communication	NS	1.0%
% of hospitals complying with JCAHO goal for hand hygiene	NS	3.0%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.2%
% of Medicare pneumonia patients receiving recommended care	NS	6.7%
% of AMI patients receiving recommended care	NS	0.3%
% of staff responding positive on teamwork across unit	NS	0.2%
% of staff responding positive on handoffs/ transitions	NS	0.0%
% of staff responding positive on nonpunitive response to error	NS	0.1%
% of hospitals that have never reported to National Practitioner Data Bank	NS	1.3%
Staffing		
% of staff responding positive on staffing	NS	0.5%
Registered nurse FTEs per 1000 inpatient days	NS	0.2%
Nursing FTEs per 1000 inpatient days	NS	0.4%
Hospitalist FTEs per 100,000 inpatient days	NS	1.4%
Case mix		
% of discharges with Medicare as primary	NS	1.5%
% of discharges with Medicaid as primary	NS	2.9%
% of discharges with private insurance as primary	NS	0.5%
% of discharges uninsured	NS	2.5%
Births as share of discharges	NS	2.0%
Average number of operating room procedures per adult discharge	NS	1.5%
Medicare case-mix index	NS	0.5%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	5.0%
Surgeries per 1,000 adults	NS	0.8%
% of discharges from hospitals with < 100 beds	NS	0.0%
% of discharges from hospitals with > 300 beds	NS	0.4%
% of discharges from for-profit hospitals	NS	2.4%
% of discharges from teaching hospitals	NS	0.0%
Average length of stay	NS	0.3%
Occupancy rate	NS	0.4%

CODING		
Percent of discharges with at least one E-code	NS	0.4%
Average number of diagnosis fields used in 2004	NS	0.1%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.0%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	0.1%
Midwest census region (compared to South census region)	NS	1.0%
Northeast census region (compared to South census region)	NS	0.0%
% of population residing in a rural area	NS	0.9%
% of population with income below poverty	NS	0.1%
% of population that is non-white	NS	0.6%
% of population with college degree	NS	6.3%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	2.1%
Teen birth rate	NS	0.3%
% of population diagnosed with pregnancy-related diabetes*	NS	2.7%
% of population diagnosed with diabetes*	NS	0.9%
% of 65+ population that has received pneumococcal vaccination*	NS	2.0%
% of population with emphesyma	NS	2.8%
% of population that currently smokes tobacco*	NS	4.6%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	6.0%
Specialist physicians per 100,000 population	NS	0.9%
Serious Board disciplinary actions per 1,000 physicians	NS	3.3%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: ACCIDENTAL PUNCTURE OR LACERATION (PSI 15)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.1%
Proactive dissemination of information to public, by year end 2004	NS	0.1%
Proactive feedback of information to providers, by year end 2004	NS	3.9%
Patient safety center, by year end 2004	NS	0.1%
Patient safety coalition, by year end 2004	NS	4.0%
Mandatory adverse event reporting, by year end 2003	NS	0.4%
Proactive dissemination of information to public, by year end 2003	NS	0.1%
Proactive feedback of information to providers, by year end 2003	NS	1.0%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	4.9%
Prohibitions against mandatory nurse overtime, by year end 2003	+	11.6%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	1.6%
% of hospitals complying with JCAHO goals for patient identification	NS	3.5%
% of hospitals complying with JCAHO goals for communication	NS	0.0%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.1%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.7%
% of Medicare pneumonia patients receiving recommended care	NS	1.7%
% of AMI patients receiving recommended care	NS	6.1%
% of staff responding positive on teamwork across unit	NS	3.5%
% of staff responding positive on handoffs/ transitions	NS	1.9%
% of staff responding positive on nonpunitive response to error	NS	3.5%
% of hospitals that have never reported to National Practitioner Data Bank	NS	3.4%
Staffing		
% of staff responding positive on staffing	NS	0.9%
Registered nurse FTEs per 1000 inpatient days	+	14.8%
Nursing FTEs per 1000 inpatient days	NS	8.4%
Hospitalist FTEs per 100,000 inpatient days	NS	6.1%
Case mix		
% of discharges with Medicare as primary	—	19.1%
% of discharges with Medicaid as primary	NS	0.2%
% of discharges with private insurance as primary	+	24.8%
% of discharges uninsured	NS	3.3%
Births as share of discharges	+	25.2%
Average number of operating room procedures per adult discharge	+	49.9%
Medicare case-mix index	+	16.2%
Other Hospital Characteristics		
Discharges per 100,000 population	—	41.8%
Surgeries per 1,000 adults	+	39.9%
% of discharges from hospitals with < 100 beds	NS	7.1%
% of discharges from hospitals with > 300 beds	NS	4.9%
% of discharges from for-profit hospitals	NS	0.0%
% of discharges from teaching hospitals	NS	0.1%
Average length of stay	—	42.0%
Occupancy rate	NS	0.9%

CODING		
Percent of discharges with at least one E-code	+	15.1%
Average number of diagnosis fields used in 2004	NS	3.0%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.9%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	+	16.4%
Midwest census region (compared to South census region)	NS	0.5%
Northeast census region (compared to South census region)	NS	0.0%
% of population residing in a rural area	NS	0.1%
% of population with income below poverty	—	17.0%
% of population that is non-white	NS	7.6%
% of population with college degree	+	14.5%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	23.2%
Teen birth rate	NS	7.0%
% of population diagnosed with pregnancy-related diabetes*	NS	0.3%
% of population diagnosed with diabetes*	—	25.6%
% of 65+ population that has received pneumococcal vaccination*	+	19.3%
% of population with emphesyma	NS	3.5%
% of population that currently smokes tobacco*	NS	10.6%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	7.5%
Specialist physicians per 100,000 population	NS	0.4%
Serious Board disciplinary actions per 1,000 physicians	NS	0.1%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: BIRTH TRAUMA - INJURY TO NEONATE (PSI 17)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.6%
Proactive dissemination of information to public, by year end 2004	NS	1.6%
Proactive feedback of information to providers, by year end 2004	NS	9.2%
Patient safety center, by year end 2004	+	13.1%
Patient safety coalition, by year end 2004	NS	4.0%
Mandatory adverse event reporting, by year end 2003	NS	6.2%
Proactive dissemination of information to public, by year end 2003	NS	1.6%
Proactive feedback of information to providers, by year end 2003	NS	0.8%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	7.1%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	8.1%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	+	26.9%
% of hospitals complying with JCAHO goals for patient identification	NS	2.9%
% of hospitals complying with JCAHO goals for communication	NS	0.7%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.7%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.6%
% of Medicare pneumonia patients receiving recommended care	NS	0.0%
% of AMI patients receiving recommended care	NS	1.0%
% of staff responding positive on teamwork across unit	NS	0.8%
% of staff responding positive on handoffs/ transitions	NS	0.7%
% of staff responding positive on nonpunitive response to error	NS	0.2%
% of hospitals that have never reported to National Practitioner Data Bank	NS	2.6%
Staffing		
% of staff responding positive on staffing	NS	3.9%
Registered nurse FTEs per 1000 inpatient days	NS	3.0%
Nursing FTEs per 1000 inpatient days	NS	6.2%
Hospitalist FTEs per 100,000 inpatient days	NS	0.4%
Case mix		
% of discharges with Medicare as primary	NS	0.1%
% of discharges with Medicaid as primary	NS	0.4%
% of discharges with private insurance as primary	NS	0.1%
% of discharges uninsured	NS	0.3%
Births as share of discharges	NS	2.1%
Average number of operating room procedures per adult discharge	NS	1.6%
Medicare case-mix index	NS	5.6%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	0.5%
Surgeries per 1,000 adults	NS	5.0%
% of discharges from hospitals with < 100 beds	NS	0.3%
% of discharges from hospitals with > 300 beds	NS	2.2%
% of discharges from for-profit hospitals	NS	8.6%
% of discharges from teaching hospitals	NS	1.1%
Average length of stay	NS	0.0%
Occupancy rate	NS	6.8%

CODING		
Percent of discharges with at least one E-code	+	13.6%
Average number of diagnosis fields used in 2004	+	17.3%
% change in number of diagnosis fields used from 2001 to 2004*	+	18.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.1%
Midwest census region (compared to South census region)	NS	2.7%
Northeast census region (compared to South census region)	NS	1.6%
% of population residing in a rural area	NS	0.0%
% of population with income below poverty	—	12.1%
% of population that is non-white	NS	3.6%
% of population with college degree	+	12.6%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	5.2%
Teen birth rate	NS	8.8%
% of population diagnosed with pregnancy-related diabetes*	NS	1.5%
% of population diagnosed with diabetes*	NS	0.2%
% of 65+ population that has received pneumococcal vaccination*	NS	0.0%
% of population with emphesyma	NS	0.4%
% of population that currently smokes tobacco*	NS	1.5%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	0.5%
Specialist physicians per 100,000 population	+	29.5%
Serious Board disciplinary actions per 1,000 physicians	NS	2.9%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: OBSTETRIC TRAUMA - VAGINAL DELIVERY WITH INSTRUMENT (PSI 18)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.4%
Proactive dissemination of information to public, by year end 2004	NS	0.1%
Proactive feedback of information to providers, by year end 2004	NS	0.4%
Patient safety center, by year end 2004	NS	2.9%
Patient safety coalition, by year end 2004	NS	0.5%
Mandatory adverse event reporting, by year end 2003	NS	0.6%
Proactive dissemination of information to public, by year end 2003	NS	0.1%
Proactive feedback of information to providers, by year end 2003	NS	0.5%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.2%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.2%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.1%
% of hospitals complying with JCAHO goals for patient identification	NS	0.3%
% of hospitals complying with JCAHO goals for communication	NS	0.5%
% of hospitals complying with JCAHO goal for hand hygiene	NS	4.0%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	2.1%
% of Medicare pneumonia patients receiving recommended care	+	13.5%
% of AMI patients receiving recommended care	NS	6.5%
% of staff responding positive on teamwork across unit	—	18.9%
% of staff responding positive on handoffs/ transitions	—	15.6%
% of staff responding positive on nonpunitive response to error	—	16.4%
% of hospitals that have never reported to National Practitioner Data Bank	NS	2.2%
Staffing		
% of staff responding positive on staffing	NS	8.8%
Registered nurse FTEs per 1000 inpatient days	NS	0.8%
Nursing FTEs per 1000 inpatient days	NS	4.5%
Hospitalist FTEs per 100,000 inpatient days	NS	0.3%
Case mix		
% of discharges with Medicare as primary	NS	0.5%
% of discharges with Medicaid as primary	—	25.8%
% of discharges with private insurance as primary	+	24.3%
% of discharges uninsured	—	16.5%
Births as share of discharges	NS	1.1%
Average number of operating room procedures per adult discharge	NS	6.3%
Medicare case-mix index	+	28.4%
Other Hospital Characteristics		
Discharges per 100,000 population	—	21.5%
Surgeries per 1,000 adults	NS	5.5%
% of discharges from hospitals with < 100 beds	+	11.8%
% of discharges from hospitals with > 300 beds	NS	0.3%
% of discharges from for-profit hospitals	—	17.4%
% of discharges from teaching hospitals	NS	5.7%
Average length of stay	NS	8.5%
Occupancy rate	NS	6.4%

CODING		
Percent of discharges with at least one E-code	NS	6.2%
Average number of diagnosis fields used in 2004	NS	0.2%
% change in number of diagnosis fields used from 2001 to 2004*	NS	1.2%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.9%
Midwest census region (compared to South census region)	+	19.4%
Northeast census region (compared to South census region)	NS	4.2%
% of population residing in a rural area	NS	5.8%
% of population with income below poverty	—	32.4%
% of population that is non-white	—	14.4%
% of population with college degree	+	11.2%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	5.5%
Teen birth rate	—	22.9%
% of population diagnosed with pregnancy-related diabetes*	NS	1.4%
% of population diagnosed with diabetes*	—	21.8%
% of 65+ population that has received pneumococcal vaccination*	+	12.1%
% of population with emphesyma	NS	0.4%
% of population that currently smokes tobacco*	NS	4.8%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	10.0%
Specialist physicians per 100,000 population	NS	0.5%
Serious Board disciplinary actions per 1,000 physicians	NS	1.0%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: OBSTETRIC TRAUMA - VAGINAL DELIVERY WITHOUT INSTRUMENT (PSI 19)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.7%
Proactive dissemination of information to public, by year end 2004	NS	3.3%
Proactive feedback of information to providers, by year end 2004	NS	5.5%
Patient safety center, by year end 2004	NS	8.7%
Patient safety coalition, by year end 2004	NS	3.9%
Mandatory adverse event reporting, by year end 2003	NS	1.3%
Proactive dissemination of information to public, by year end 2003	NS	5.3%
Proactive feedback of information to providers, by year end 2003	NS	5.8%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.4%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	1.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	1.5%
% of hospitals complying with JCAHO goals for patient identification	NS	2.2%
% of hospitals complying with JCAHO goals for communication	NS	0.9%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.0%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.1%
% of Medicare pneumonia patients receiving recommended care	+	10.7%
% of AMI patients receiving recommended care	NS	0.8%
% of staff responding positive on teamwork across unit	NS	0.4%
% of staff responding positive on handoffs/ transitions	NS	0.3%
% of staff responding positive on nonpunitive response to error	NS	0.1%
% of hospitals that have never reported to National Practitioner Data Bank	+	14.9%
Staffing		
% of staff responding positive on staffing	NS	0.3%
Registered nurse FTEs per 1000 inpatient days	NS	5.6%
Nursing FTEs per 1000 inpatient days	NS	7.1%
Hospitalist FTEs per 100,000 inpatient days	NS	3.0%
Case mix		
% of discharges with Medicare as primary	NS	2.7%
% of discharges with Medicaid as primary	NS	9.7%
% of discharges with private insurance as primary	NS	2.1%
% of discharges uninsured	NS	7.2%
Births as share of discharges	NS	1.9%
Average number of operating room procedures per adult discharge	NS	0.7%
Medicare case-mix index	NS	9.7%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	0.3%
Surgeries per 1,000 adults	NS	0.8%
% of discharges from hospitals with < 100 beds	NS	1.3%
% of discharges from hospitals with > 300 beds	NS	0.0%
% of discharges from for-profit hospitals	NS	8.4%
% of discharges from teaching hospitals	NS	0.1%
Average length of stay	NS	0.0%
Occupancy rate	NS	3.8%

CODING		
Percent of discharges with at least one E-code	NS	0.1%
Average number of diagnosis fields used in 2004	NS	0.0%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.0%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	3.6%
Midwest census region (compared to South census region)	+	15.7%
Northeast census region (compared to South census region)	NS	0.8%
% of population residing in a rural area	NS	10.5%
% of population with income below poverty	NS	4.1%
% of population that is non-white	NS	0.1%
% of population with college degree	NS	1.2%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	7.6%
Teen birth rate	NS	0.5%
% of population diagnosed with pregnancy-related diabetes*	NS	1.9%
% of population diagnosed with diabetes*	NS	0.1%
% of 65+ population that has received pneumococcal vaccination*	NS	0.0%
% of population with emphesyma	NS	2.1%
% of population that currently smokes tobacco*	NS	3.7%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	6.0%
Specialist physicians per 100,000 population	NS	1.5%
Serious Board disciplinary actions per 1,000 physicians	NS	1.4%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: OBSTETRIC TRAUMA - CESAREAN DELIVERY (PSI 20)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.1%
Proactive dissemination of information to public, by year end 2004	NS	0.1%
Proactive feedback of information to providers, by year end 2004	NS	0.0%
Patient safety center, by year end 2004	NS	0.0%
Patient safety coalition, by year end 2004	NS	3.7%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	1.2%
Proactive feedback of information to providers, by year end 2003	NS	0.0%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.1%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	1.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.7%
% of hospitals complying with JCAHO goals for patient identification	—	13.6%
% of hospitals complying with JCAHO goals for communication	NS	2.5%
% of hospitals complying with JCAHO goal for hand hygiene	NS	0.2%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	3.0%
% of Medicare pneumonia patients receiving recommended care	NS	2.0%
% of AMI patients receiving recommended care	+	22.5%
% of staff responding positive on teamwork across unit	—	20.3%
% of staff responding positive on handoffs/ transitions	—	14.2%
% of staff responding positive on nonpunitive response to error	—	22.4%
% of hospitals that have never reported to National Practitioner Data Bank	NS	4.3%
Staffing		
% of staff responding positive on staffing	—	20.9%
Registered nurse FTEs per 1000 inpatient days	NS	7.0%
Nursing FTEs per 1000 inpatient days	—	16.3%
Hospitalist FTEs per 100,000 inpatient days	NS	2.1%
Case mix		
% of discharges with Medicare as primary	NS	0.3%
% of discharges with Medicaid as primary	NS	1.3%
% of discharges with private insurance as primary	NS	6.9%
% of discharges uninsured	—	17.0%
Births as share of discharges	NS	0.1%
Average number of operating room procedures per adult discharge	NS	6.5%
Medicare case-mix index	NS	3.8%
Other Hospital Characteristics		
Discharges per 100,000 population	—	21.8%
Surgeries per 1,000 adults	NS	6.4%
% of discharges from hospitals with < 100 beds	NS	6.9%
% of discharges from hospitals with > 300 beds	NS	1.5%
% of discharges from for-profit hospitals	—	29.6%
% of discharges from teaching hospitals	+	22.2%
Average length of stay	NS	2.1%
Occupancy rate	NS	0.6%

CODING		
Percent of discharges with at least one E-code	+	31.0%
Average number of diagnosis fields used in 2004	NS	3.7%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.1%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	0.1%
Midwest census region (compared to South census region)	NS	0.0%
Northeast census region (compared to South census region)	+	23.1%
% of population residing in a rural area	NS	3.1%
% of population with income below poverty	—	24.1%
% of population that is non-white	—	11.8%
% of population with college degree	+	20.4%
Health-related Population Characteristics		
% of population that is overweight or obese*	—	27.8%
Teen birth rate	—	37.1%
% of population diagnosed with pregnancy-related diabetes*	NS	1.4%
% of population diagnosed with diabetes*	—	18.6%
% of 65+ population that has received pneumococcal vaccination*	+	16.6%
% of population with emphesyma	NS	4.1%
% of population that currently smokes tobacco*	NS	0.9%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	8.9%
Specialist physicians per 100,000 population	+	22.5%
Serious Board disciplinary actions per 1,000 physicians	NS	1.1%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: FOREIGN BODY LEFT DURING PROCEDURE (PSI 21)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	7.4%
Proactive dissemination of information to public, by year end 2004	NS	3.3%
Proactive feedback of information to providers, by year end 2004	NS	5.8%
Patient safety center, by year end 2004	NS	4.6%
Patient safety coalition, by year end 2004	+	13.1%
Mandatory adverse event reporting, by year end 2003	NS	1.1%
Proactive dissemination of information to public, by year end 2003	NS	4.0%
Proactive feedback of information to providers, by year end 2003	NS	0.7%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.0%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	6.9%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	2.0%
% of hospitals complying with JCAHO goals for patient identification	NS	2.3%
% of hospitals complying with JCAHO goals for communication	NS	0.9%
% of hospitals complying with JCAHO goal for hand hygiene	NS	9.3%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.7%
% of Medicare pneumonia patients receiving recommended care	NS	0.4%
% of AMI patients receiving recommended care	NS	7.0%
% of staff responding positive on teamwork across unit	NS	0.9%
% of staff responding positive on handoffs/ transitions	NS	0.5%
% of staff responding positive on nonpunitive response to error	NS	0.9%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.0%
Staffing		
% of staff responding positive on staffing	NS	0.0%
Registered nurse FTEs per 1000 inpatient days	NS	3.0%
Nursing FTEs per 1000 inpatient days	NS	0.8%
Hospitalist FTEs per 100,000 inpatient days	NS	2.9%
Case mix		
% of discharges with Medicare as primary	NS	5.5%
% of discharges with Medicaid as primary	NS	0.8%
% of discharges with private insurance as primary	NS	8.5%
% of discharges uninsured	NS	9.4%
Births as share of discharges	NS	0.2%
Average number of operating room procedures per adult discharge	+	18.8%
Medicare case-mix index	NS	6.4%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	4.0%
Surgeries per 1,000 adults	NS	9.7%
% of discharges from hospitals with < 100 beds	NS	0.1%
% of discharges from hospitals with > 300 beds	NS	2.5%
% of discharges from for-profit hospitals	NS	8.2%
% of discharges from teaching hospitals	NS	6.0%
Average length of stay	NS	8.8%
Occupancy rate	NS	0.8%

CODING		
Percent of discharges with at least one E-code	+	23.7%
Average number of diagnosis fields used in 2004	+	19.7%
% change in number of diagnosis fields used from 2001 to 2004*	NS	5.3%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	0.6%
Midwest census region (compared to South census region)	NS	5.7%
Northeast census region (compared to South census region)	NS	0.5%
% of population residing in a rural area	NS	3.6%
% of population with income below poverty	NS	7.9%
% of population that is non-white	NS	0.9%
% of population with college degree	NS	11.8%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	7.9%
Teen birth rate	NS	4.9%
% of population diagnosed with pregnancy-related diabetes*	NS	4.3%
% of population diagnosed with diabetes*	NS	11.1%
% of 65+ population that has received pneumococcal vaccination*	NS	9.0%
% of population with emphesyma	NS	0.0%
% of population that currently smokes tobacco*	NS	0.7%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	0.3%
Specialist physicians per 100,000 population	+	12.4%
Serious Board disciplinary actions per 1,000 physicians	NS	0.5%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: IATROGENIC PNEUMOTHORAX (PSI 22)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.3%
Proactive dissemination of information to public, by year end 2004	NS	3.3%
Proactive feedback of information to providers, by year end 2004	NS	3.1%
Patient safety center, by year end 2004	NS	2.4%
Patient safety coalition, by year end 2004	+	16.8%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	5.7%
Proactive feedback of information to providers, by year end 2003	NS	1.2%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	1.7%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	2.2%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	7.0%
% of hospitals complying with JCAHO goals for patient identification	NS	3.9%
% of hospitals complying with JCAHO goals for communication	NS	2.3%
% of hospitals complying with JCAHO goal for hand hygiene	NS	6.4%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	1.8%
% of Medicare pneumonia patients receiving recommended care	NS	0.9%
% of AMI patients receiving recommended care	NS	0.2%
% of staff responding positive on teamwork across unit	+	12.4%
% of staff responding positive on handoffs/ transitions	NS	10.1%
% of staff responding positive on nonpunitive response to error	+	21.1%
% of hospitals that have never reported to National Practitioner Data Bank	NS	2.7%
Staffing		
% of staff responding positive on staffing	+	18.2%
Registered nurse FTEs per 1000 inpatient days	NS	0.0%
Nursing FTEs per 1000 inpatient days	NS	2.4%
Hospitalist FTEs per 100,000 inpatient days	NS	0.0%
Case mix		
% of discharges with Medicare as primary	NS	3.7%
% of discharges with Medicaid as primary	NS	1.7%
% of discharges with private insurance as primary	—	13.8%
% of discharges uninsured	NS	2.7%
Births as share of discharges	—	12.2%
Average number of operating room procedures per adult discharge	NS	1.6%
Medicare case-mix index	NS	8.9%
Other Hospital Characteristics		
Discharges per 100,000 population	+	33.2%
Surgeries per 1,000 adults	NS	2.3%
% of discharges from hospitals with < 100 beds	NS	8.0%
% of discharges from hospitals with > 300 beds	NS	5.1%
% of discharges from for-profit hospitals	NS	3.5%
% of discharges from teaching hospitals	NS	2.7%
Average length of stay	NS	1.6%
Occupancy rate	NS	0.8%

CODING		
Percent of discharges with at least one E-code	NS	2.4%
Average number of diagnosis fields used in 2004	NS	8.4%
% change in number of diagnosis fields used from 2001 to 2004*	NS	4.9%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	3.3%
Midwest census region (compared to South census region)	NS	0.0%
Northeast census region (compared to South census region)	NS	5.7%
% of population residing in a rural area	NS	2.7%
% of population with income below poverty	+	22.2%
% of population that is non-white	NS	0.0%
% of population with college degree	NS	8.5%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	6.1%
Teen birth rate	+	23.9%
% of population diagnosed with pregnancy-related diabetes*	NS	1.4%
% of population diagnosed with diabetes*	NS	7.0%
% of 65+ population that has received pneumococcal vaccination*	NS	3.8%
% of population with emphesyma	NS	1.0%
% of population that currently smokes tobacco*	+	20.4%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	5.0%
Specialist physicians per 100,000 population	NS	0.1%
Serious Board disciplinary actions per 1,000 physicians	NS	2.7%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: SELECTED INFECTIONS DUE TO MEDICAL CARE (PSI 23)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	1.6%
Proactive dissemination of information to public, by year end 2004	NS	3.4%
Proactive feedback of information to providers, by year end 2004	NS	0.1%
Patient safety center, by year end 2004	NS	4.2%
Patient safety coalition, by year end 2004	NS	4.7%
Mandatory adverse event reporting, by year end 2003	NS	0.8%
Proactive dissemination of information to public, by year end 2003	NS	4.8%
Proactive feedback of information to providers, by year end 2003	NS	0.9%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	0.7%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	0.5%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.5%
% of hospitals complying with JCAHO goals for patient identification	NS	5.6%
% of hospitals complying with JCAHO goals for communication	NS	0.0%
% of hospitals complying with JCAHO goal for hand hygiene	NS	7.7%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	0.4%
% of Medicare pneumonia patients receiving recommended care	—	11.2%
% of AMI patients receiving recommended care	NS	1.3%
% of staff responding positive on teamwork across unit	+	18.3%
% of staff responding positive on handoffs/ transitions	+	20.6%
% of staff responding positive on nonpunitive response to error	+	19.7%
% of hospitals that have never reported to National Practitioner Data Bank	NS	5.9%
Staffing		
% of staff responding positive on staffing	NS	7.3%
Registered nurse FTEs per 1000 inpatient days	NS	2.7%
Nursing FTEs per 1000 inpatient days	NS	4.4%
Hospitalist FTEs per 100,000 inpatient days	NS	3.7%
Case mix		
% of discharges with Medicare as primary	NS	0.2%
% of discharges with Medicaid as primary	NS	4.3%
% of discharges with private insurance as primary	NS	9.5%
% of discharges uninsured	NS	6.8%
Births as share of discharges	—	11.6%
Average number of operating room procedures per adult discharge	NS	4.3%
Medicare case-mix index	—	17.3%
Other Hospital Characteristics		
Discharges per 100,000 population	+	28.5%
Surgeries per 1,000 adults	NS	5.0%
% of discharges from hospitals with < 100 beds	—	45.3%
% of discharges from hospitals with > 300 beds	+	18.6%
% of discharges from for-profit hospitals	+	11.1%
% of discharges from teaching hospitals	NS	1.7%
Average length of stay	NS	9.5%
Occupancy rate	+	28.7%

CODING		
Percent of discharges with at least one E-code	NS	1.0%
Average number of diagnosis fields used in 2004	+	15.7%
% change in number of diagnosis fields used from 2001 to 2004*	NS	4.4%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	2.2%
Midwest census region (compared to South census region)	NS	7.7%
Northeast census region (compared to South census region)	NS	0.1%
% of population residing in a rural area	—	28.3%
% of population with income below poverty	+	12.0%
% of population that is non-white	NS	5.1%
% of population with college degree	NS	0.7%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	1.6%
Teen birth rate	+	17.8%
% of population diagnosed with pregnancy-related diabetes*	NS	6.6%
% of population diagnosed with diabetes*	+	15.5%
% of 65+ population that has received pneumococcal vaccination*	NS	10.5%
% of population with emphesyma	NS	0.2%
% of population that currently smokes tobacco*	+	13.3%
Physician Characteristics		
Generalists physicians per 100,000 population	—	41.4%
Specialist physicians per 100,000 population	NS	3.0%
Serious Board disciplinary actions per 1,000 physicians	NS	1.7%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE WOUND DEHISCENCE IN ABDOMINOPELVIC SURGERY PATIENTS (PSI 24)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.7%
Proactive dissemination of information to public, by year end 2004	NS	0.0%
Proactive feedback of information to providers, by year end 2004	NS	0.2%
Patient safety center, by year end 2004	NS	0.7%
Patient safety coalition, by year end 2004	NS	0.7%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	0.1%
Proactive feedback of information to providers, by year end 2003	NS	0.2%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	2.6%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	3.3%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	2.1%
% of hospitals complying with JCAHO goals for patient identification	NS	0.4%
% of hospitals complying with JCAHO goals for communication	NS	4.7%
% of hospitals complying with JCAHO goal for hand hygiene	NS	1.0%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	4.3%
% of Medicare pneumonia patients receiving recommended care	+	10.9%
% of AMI patients receiving recommended care	—	12.3%
% of staff responding positive on teamwork across unit	NS	2.2%
% of staff responding positive on handoffs/ transitions	NS	2.3%
% of staff responding positive on nonpunitive response to error	NS	8.8%
% of hospitals that have never reported to National Practitioner Data Bank	+	15.0%
Staffing		
% of staff responding positive on staffing	+	15.9%
Registered nurse FTEs per 1000 inpatient days	NS	2.7%
Nursing FTEs per 1000 inpatient days	NS	1.2%
Hospitalist FTEs per 100,000 inpatient days	NS	6.4%
Case mix		
% of discharges with Medicare as primary	+	14.0%
% of discharges with Medicaid as primary	NS	2.3%
% of discharges with private insurance as primary	NS	5.4%
% of discharges uninsured	NS	2.9%
Births as share of discharges	NS	6.9%
Average number of operating room procedures per adult discharge	NS	0.8%
Medicare case-mix index	NS	0.0%
Other Hospital Characteristics		
Discharges per 100,000 population	+	18.4%
Surgeries per 1,000 adults	NS	1.5%
% of discharges from hospitals with < 100 beds	+	16.2%
% of discharges from hospitals with > 300 beds	NS	2.9%
% of discharges from for-profit hospitals	NS	0.2%
% of discharges from teaching hospitals	NS	4.5%
Average length of stay	NS	2.6%
Occupancy rate	—	19.0%

CODING		
Percent of discharges with at least one E-code	NS	1.1%
Average number of diagnosis fields used in 2004	NS	0.9%
% change in number of diagnosis fields used from 2001 to 2004*	NS	0.3%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	4.6%
Midwest census region (compared to South census region)	+	15.6%
Northeast census region (compared to South census region)	NS	7.3%
% of population residing in a rural area	+	17.5%
% of population with income below poverty	NS	9.5%
% of population that is non-white	—	24.3%
% of population with college degree	—	19.7%
Health-related Population Characteristics		
% of population that is overweight or obese*	+	17.5%
Teen birth rate	NS	5.1%
% of population diagnosed with pregnancy-related diabetes*	NS	9.7%
% of population diagnosed with diabetes*	NS	2.9%
% of 65+ population that has received pneumococcal vaccination*	NS	0.8%
% of population with emphesyma	NS	3.3%
% of population that currently smokes tobacco*	+	18.6%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	2.1%
Specialist physicians per 100,000 population	—	11.0%
Serious Board disciplinary actions per 1,000 physicians	NS	0.0%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: ACCIDENTAL PUNCTURE OR LACERATION (PSI 25)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	0.1%
Proactive dissemination of information to public, by year end 2004	NS	0.3%
Proactive feedback of information to providers, by year end 2004	NS	4.1%
Patient safety center, by year end 2004	NS	0.3%
Patient safety coalition, by year end 2004	NS	8.5%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	0.4%
Proactive feedback of information to providers, by year end 2003	NS	1.0%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	3.9%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	8.2%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	0.6%
% of hospitals complying with JCAHO goals for patient identification	NS	0.0%
% of hospitals complying with JCAHO goals for communication	NS	0.4%
% of hospitals complying with JCAHO goal for hand hygiene	NS	4.3%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	2.3%
% of Medicare pneumonia patients receiving recommended care	NS	0.2%
% of AMI patients receiving recommended care	NS	2.1%
% of staff responding positive on teamwork across unit	NS	0.0%
% of staff responding positive on handoffs/ transitions	NS	0.1%
% of staff responding positive on nonpunitive response to error	NS	0.2%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.0%
Staffing		
% of staff responding positive on staffing	NS	1.9%
Registered nurse FTEs per 1000 inpatient days	+	15.7%
Nursing FTEs per 1000 inpatient days	+	12.4%
Hospitalist FTEs per 100,000 inpatient days	NS	4.5%
Case mix		
% of discharges with Medicare as primary	NS	8.5%
% of discharges with Medicaid as primary	NS	1.2%
% of discharges with private insurance as primary	+	13.6%
% of discharges uninsured	NS	2.6%
Births as share of discharges	NS	9.7%
Average number of operating room procedures per adult discharge	+	37.4%
Medicare case-mix index	NS	8.8%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	7.5%
Surgeries per 1,000 adults	+	28.9%
% of discharges from hospitals with < 100 beds	NS	3.0%
% of discharges from hospitals with > 300 beds	NS	0.3%
% of discharges from for-profit hospitals	NS	0.1%
% of discharges from teaching hospitals	NS	0.0%
Average length of stay	—	39.8%
Occupancy rate	NS	2.3%

CODING		
Percent of discharges with at least one E-code	+	10.9%
Average number of diagnosis fields used in 2004	NS	4.7%
% change in number of diagnosis fields used from 2001 to 2004*	NS	3.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	4.5%
Midwest census region (compared to South census region)	NS	1.3%
Northeast census region (compared to South census region)	NS	3.1%
% of population residing in a rural area	NS	0.6%
% of population with income below poverty	NS	3.8%
% of population that is non-white	—	17.1%
% of population with college degree	NS	2.9%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	5.1%
Teen birth rate	NS	0.8%
% of population diagnosed with pregnancy-related diabetes*	NS	1.6%
% of population diagnosed with diabetes*	—	13.1%
% of 65+ population that has received pneumococcal vaccination*	+	16.6%
% of population with emphesyma	NS	2.1%
% of population that currently smokes tobacco*	NS	1.4%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	3.2%
Specialist physicians per 100,000 population	NS	0.3%
Serious Board disciplinary actions per 1,000 physicians	NS	0.4%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

RESULTS OF ANALYSIS OF STATE-LEVEL VARIATION FOR 2004: POSTOPERATIVE HEMORRHAGE OR HEMATOMA (PSI 27)

Potential Explanatory Factors	Type of Association[1]	Percent of State Variation Explained (R-square)
STATE POLICY CHARACTERISTICS		
Patient Safety Infrastructure		
Mandatory adverse event reporting, by year end 2004	NS	2.6%
Proactive dissemination of information to public, by year end 2004	NS	1.1%
Proactive feedback of information to providers, by year end 2004	NS	6.3%
Patient safety center, by year end 2004	NS	8.7%
Patient safety coalition, by year end 2004	+	21.8%
Mandatory adverse event reporting, by year end 2003	NS	0.0%
Proactive dissemination of information to public, by year end 2003	NS	2.7%
Proactive feedback of information to providers, by year end 2003	NS	0.4%
Provider Regulation		
Prohibitions against mandatory nurse overtime, by year end 2004	NS	4.0%
Prohibitions against mandatory nurse overtime, by year end 2003	NS	8.9%
HOSPITAL CHARACTERISTICS		
Safety Processes		
% of hospitals in QIO project on surgical infection prevention*	NS	1.4%
% of hospitals complying with JCAHO goals for patient identification	NS	7.7%
% of hospitals complying with JCAHO goals for communication	NS	0.9%
% of hospitals complying with JCAHO goal for hand hygiene	NS	9.5%
Institutional Culture		
% of hospitals with Nurse Magnet Certification	NS	1.4%
% of Medicare pneumonia patients receiving recommended care	NS	1.1%
% of AMI patients receiving recommended care	NS	1.8%
% of staff responding positive on teamwork across unit	NS	1.3%
% of staff responding positive on handoffs/ transitions	NS	0.8%
% of staff responding positive on nonpunitive response to error	NS	4.0%
% of hospitals that have never reported to National Practitioner Data Bank	NS	0.2%
Staffing		
% of staff responding positive on staffing	NS	5.1%
Registered nurse FTEs per 1000 inpatient days	NS	5.7%
Nursing FTEs per 1000 inpatient days	NS	7.9%
Hospitalist FTEs per 100,000 inpatient days	NS	1.0%
Case mix		
% of discharges with Medicare as primary	NS	0.0%
% of discharges with Medicaid as primary	NS	0.0%
% of discharges with private insurance as primary	NS	0.1%
% of discharges uninsured	NS	0.0%
Births as share of discharges	NS	3.1%
Average number of operating room procedures per adult discharge	NS	1.5%
Medicare case-mix index	NS	4.5%
Other Hospital Characteristics		
Discharges per 100,000 population	NS	9.3%
Surgeries per 1,000 adults	NS	0.4%
% of discharges from hospitals with < 100 beds	NS	3.7%
% of discharges from hospitals with > 300 beds	NS	2.0%
% of discharges from for-profit hospitals	NS	0.5%
% of discharges from teaching hospitals	NS	1.2%
Average length of stay	NS	1.8%
Occupancy rate	NS	3.2%

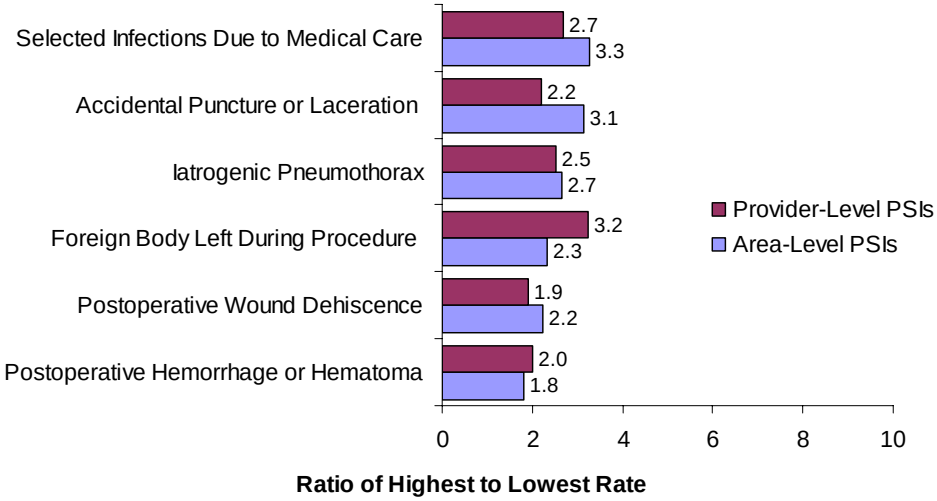
CODING		
Percent of discharges with at least one E-code	+	12.4%
Average number of diagnosis fields used in 2004	+	17.2%
% change in number of diagnosis fields used from 2001 to 2004*	NS	7.8%
OTHER CHARACTERISTICS		
Socio-demographics		
Census region		
West census region (compared to South census region)	NS	1.3%
Midwest census region (compared to South census region)	NS	0.4%
Northeast census region (compared to South census region)	NS	0.8%
% of population residing in a rural area	NS	8.6%
% of population with income below poverty	NS	0.6%
% of population that is non-white	NS	1.4%
% of population with college degree	NS	0.9%
Health-related Population Characteristics		
% of population that is overweight or obese*	NS	0.2%
Teen birth rate	NS	0.3%
% of population diagnosed with pregnancy-related diabetes*	NS	0.1%
% of population diagnosed with diabetes*	NS	0.5%
% of 65+ population that has received pneumococcal vaccination*	NS	0.1%
% of population with emphesyma	NS	0.1%
% of population that currently smokes tobacco*	NS	1.5%
Physician Characteristics		
Generalists physicians per 100,000 population	NS	3.9%
Specialist physicians per 100,000 population	NS	5.9%
Serious Board disciplinary actions per 1,000 physicians	NS	0.4%

[1] Positive sign (+) indicates positive association, statistically significant at $p<0.05$; negative sign (—) indicates negative association, statistically significant at $p<0.05$; NS indicates no statistically significant association.

* Unlike the other factors analyzed for this PSI, less than 33 states were analyzed for this factor due to data availability.

APPENDIX F: PROVIDER-LEVEL AND AREA-LEVEL PSIs

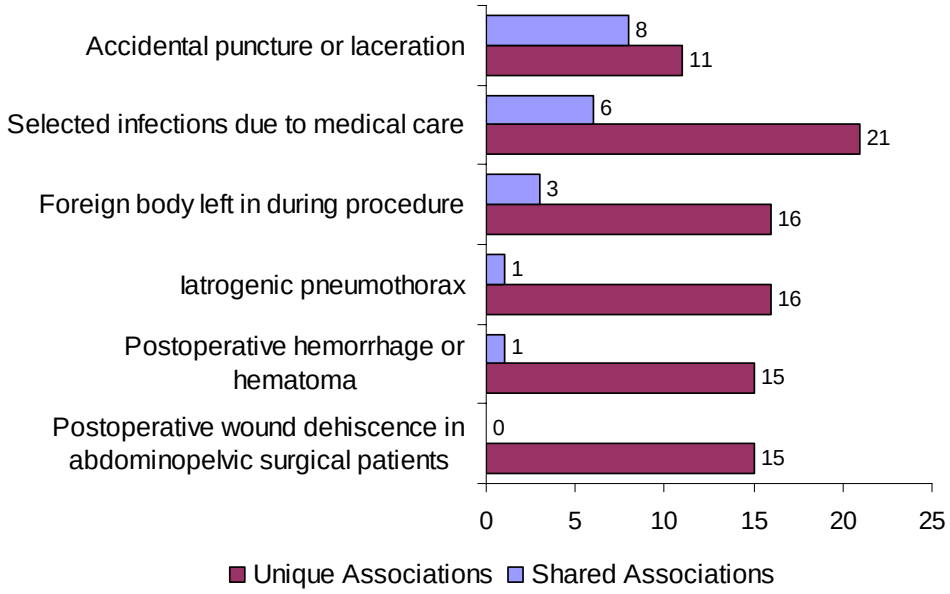
STATE VARIATION IN AREA-LEVEL AND RELATED PROVIDER-LEVEL PSIs, 2004



As shown above, one way to group PSIs is by provider-level vs. area-level indicator. Conceptually, the area-level indicator differs from the provider-level indicator in that the former counts both the initial hospitalization during which the complication occurred as well as subsequent hospitalizations required to further address the complication (i.e., cases where either a secondary diagnosis code or the principal diagnosis code flags a complication of care), while the latter counts only the initial hospitalization (i.e., only cases where a secondary diagnosis code flags a potentially preventable complication). Further, the area-level indicators measure the incidence of an event relative to an area's population, while the provider-level indicators measure the incidence of an event relative to the number of relevant discharges. These conceptual differences mean that the numerators and denominators of corresponding provider- and area-level PSI "pairs" are different from each other, as are the resulting rates.

Comparison of correlation results for provider- and area-level PSI pairs shows that the majority of factors with statistically significant associations are unique to one indicator in the pair (i.e., they are not significant for the other indicator). The number of statistically significant factors that provider- and area-level PSI pairs have in common ranges from zero to eight, with the highest number of "shared" associations for accidental puncture or laceration and selected infections due to medical care, as shown in the next figure. When provider- and area-level PSI pairs have statistically significant associations with the same factor, it is reassuring that the direction of the relationship is the same, though the percent of variation explained by the factor differs. Regardless of the conceptual and methodological differences, at their core, each provider- and area-level PSI pair is measuring the same type of patient safety event. That is, the type of discharge characteristics that count as iatrogenic pneumothorax is the same for both provider- and area-level PSIs, though the area-level PSIs take one more diagnosis field (the principal diagnosis) into account to make this determination. It is reasonable to expect a given factor to have the same type of influence on these events.

NUMBER OF SIGNIFICANT ASSOCIATIONS WITH FACTORS FOR AREA- AND PROVIDER-LEVEL PSI PAIRS



APPENDIX G: E CODING

Not all states require use of external cause-of-injury (E code) data for discharge abstract data and, as a result, states have varied rates of E code usage. Among 2004 HCUP SID states, the proportion of discharge records containing at least one E code of any type ranged from 6 to 17 percent. It is expected that PSIs that are based on capturing E code data would differ from state to state at least in part for this reason. As shown in Appendix B, correlation analysis of 22 PSIs confirmed that there was a statistically significant, positive association between E code usage and state rates in 2004 for four out of five PSIs that used E codes in their definitions. What is more, the use of E codes in discharge data was positively associated with (and statistically significant for) the rates of five PSIs which are *not* based on capturing E code data. One interpretation of these results is that states that require or otherwise encourage E code usage are more demanding of hospital coding practices overall. Note that the E code measure used in the correlation was not specific to PSIs but, rather, reflected use of E codes of any type.

Patient Safety Indicators Included in Analysis	Whether E-codes are part of algorithm	Whether E-code usage** was associated*** with States' PSI rates
Complications of anesthesia (PSI 1)	Yes	No
Death in low mortality DRGs (PSI 2)	No	No
Failure to rescue (PSI 4)	No	No
Foreign body left in during procedure (PSI 5)	Yes	Yes
Iatrogenic pneumothorax (PSI 6)	No	Yes
Selected infections due to medical care (PSI 7)	No	No
Postoperative hemorrhage or hematoma (PSI 9)	No	Yes
Postoperative physiologic and metabolic derangements (PSI 10)	No	No
Postoperative respiratory failure (PSI 11)	No	No
Postoperative sepsis (PSI 13)	No	No
Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 14)	No	No
Accidental puncture or laceration (PSI 15)	Yes	Yes
Birth trauma – injury to neonate (PSI 17)	No	Yes
Obstetric trauma – vaginal delivery with instrument (PSI 18)	No	No
Obstetric trauma – vaginal delivery without instrument (PSI 19)	No	No
Obstetric trauma – cesarean delivery (PSI 20)	No	Yes
Foreign body left during procedure (PSI 21)	Yes	Yes
Iatrogenic pneumothorax (PSI 22)	No	No
Selected infections due to medical care (PSI 23)	No	No
Postoperative wound dehiscence in abdominopelvic surgical patients (PSI 24)	No	No
Accidental puncture or laceration (PSI 25)	Yes	Yes
Postoperative hemorrhage or hematoma (PSI 27)	No	Yes

**E-code usage was measured as a percent of discharges in the State with at least one E-code of any type

***All such associations were positive, meaning higher E-code usage was associated with higher PSI rates