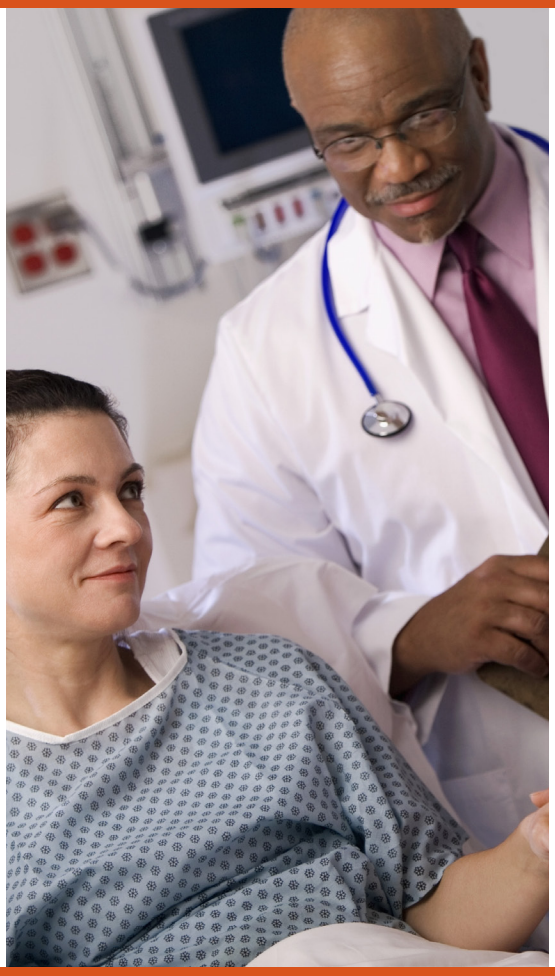
NATIONAL AND STATE HEALTHCARE-ASSOCIATED INFECTIONS STANDARDIZED INFECTION RATIO REPORT

Using Data Reported to the National Healthcare Safety Network



January – December 2010

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

CS229869

Background

The National Healthcare Safety Network (NHSN) is a public health surveillance system that the Centers for Disease Control and Prevention's (CDC) Division of Healthcare Quality Promotion (DHQP) maintains and supports as a mainstay of its healthcare-associated infection (HAI) prevention program. NHSN is used by healthcare facilities in all 50 states, Washington, D.C., and Puerto Rico. Participation in NHSN is a state-mandated requirement for healthcare facilities in an increasing number of states. As of December 2011, 22 states and Washington, D.C., require, or have plans to require, use of NHSN for HAI reporting mandates. Central line-associated bloodstream infections (CLABSIs) and surgical site infections (SSIs) are the HAIs most frequently mandated by states that use NHSN as their operational system for mandatory reporting. As of January 2011, hospitals participating in the Centers for Medicare and Medicaid Services' (CMS) Hospital Inpatient Quality Reporting Program are using NHSN to report CLABSIs among adult, pediatric, and neonatal intensive care unit patients. The CLABSI data reported via NHSN to CMS will be used to qualify hospitals for their annual payment update and for public reporting (starting January 2012) at the Department of Health and Human Services Hospital Compare web site. Similar reporting on SSIs to qualify hospitals began in January 2012. These mandates, coupled with the use of NHSN to comply with requirements by CMS, has led to a roughly 50% increase in the number of facilities reporting to NHSN between 2009 and the end of 2010.

Since NHSN's inception in 2005, DHQP has used HAI data from the system for national-level analysis and reporting.[1] Past reporting includes summary data that define the benchmarks used for interfacility comparisons such as location specific device-associated infection rates,[1] risk adjustment models for SSIs,[2] or summarized antimicrobial resistance data for each HAI type reported.[3] This current report provides a summary of the characteristics of facilities reporting by state, and the key metrics of the HAI experience for the United States for 2010. It expands on previous reports in several ways.[4] At the national level, reports on SSIs have been expanded to summarize select procedure-specific experience, and data on catheter-associated urinary tract infections (CAUTIs) has been added for the first time. In addition, for CLABSIs and CAUTIs, the standardized infection ratios (SIRs) are summarized for all patient care areas, and by major groupings of patient care areas (e.g., critical care areas, ward areas, neonatal intensive care units). State-specific summary statistics are again presented. Although these data are limited to CLABSI in this report, summary statistics are presented for all states, Washington, D.C., and Puerto Rico regardless of reporting mandates. As additional facilities begin reporting data on other HAI types in a more comprehensive manner that are reflective of state-specific progress, additional state-specific summary statistics will be included in future reports.

Changes in the 2009 SIR compared to the 2010 SIR are presented for CLABSI and SSI (2009[5] is the baseline year for CAUTI, so serial annual SIRs will be calculated next year), and for CLABSI it is also presented for each state. The goals of this report are to summarize available HAI data on CLABSI, SSI, and CAUTI data at the national level for 2010 and to gain additional perspective on the progress of HAI prevention nationally by comparison to the 2009 experience. This progress provides insights toward goals set forth in the Department of Health and Human Services (HHS) Action Plan to Prevent HAIs, and as states move forward with implementation of state HAI programs. The current report is limited to facilities reporting data from January 2010 through December 2010. However, during 2011, many states continued to make progress in extending NHSN surveillance activities to additional healthcare facilities.

The HAI data presented in this report are summarized using the SIR, a summary statistic used to measure relative difference in HAI occurrence during a reporting period compared to a common referent period (e.g., standard population). In HAI data analysis, the SIR compares the actual number of HAIs with the predicted number based on the baseline U.S. experience (e.g., standard population), adjusting for several risk factors that have been found to be most associated with differences in infection rates. The aggregate SIRs presented in this report are quantitative indicators of the current status of HAI prevention in acute care hospitals from across the United States for three major HAIs and of national progress toward their prevention. However, the SIRs are not intended to serve as comprehensive and conclusive HAI measures for all uses and users of HAI data. More specific data at the state and healthcare facility levels are needed to target specific HAI problems and monitor impact of prevention programs. Publication of this report is one step among many in providing data needed for analysis and action at all levels, with the intent of spurring additional progress toward HAI elimination throughout the United States.

Methods

Eligible Data

This report includes data from surveillance activities performed during 2010 and reported either mandatorily or voluntarily by healthcare facilities to NHSN from facilities across all 50 states, Washington, D.C., and Puerto Rico. Data used in these calculations were restricted to the most up-to-date NHSN definition for CLABSI in 2008,[6] and for CAUTI in 2009.[7] Any data reported from non-acute care hospitals (e.g., long-term care hospitals) and from dialysis wards or facilities were excluded from this report. All acute care hospital patient care locations were included in this report. Data were accessed October 5, 2011, to allow for a 10-month latency period to help ensure complete reporting of HAIs and denominator data through December 2010. This is slightly extended compared to the 6-month latency period of previous reports.

To illustrate the degree to which facilities reported to NHSN during 2009 and 2010 in the United States, this report presents the number of facilities and the number of patient care locations reporting within each state. In addition to presenting an all-inclusive category of locations, locations were also stratified into three mutually exclusive groups that reported to NHSN, by state: (for this report, wards also include step-down, specialty care areas [including hematology/oncology, bone marrow transplant], and long-term acute care locations/facilities), and neonatal intensive care units (includes Level II/III and Level III). To facilitate an assessment of growing capacity for NHSN to be used for surveillance and prevention activities, these reporting characteristics have been summarized for each reporting period (2009 and 2010). Although comparisons of HAI experience were made at the location level using existing descriptions of location, further work is needed to confirm the accurate categorization of several location types by reporting facilities. These types include improved categorization of long-term acute care locations and confirmation of accurate mapping of hematology/oncology locations. Therefore, summary statistics for these distinct patient-care areas will be considered in future years after confirmation and accurate categorization has occurred.

The SSI data reported here include only a subset of the operative procedures on which facilities perform surveillance and report HAI data. This subset includes many of the more commonly reported procedures and approximates those targeted for process-of-care improvements by the Surgical Care Improvement Project (SCIP), a national program led by CMS and CMS-funded Quality Improvement Organizations.[8] CDC compared these procedures to NHSN procedure categories and determined the most

appropriate mapping between the two groups of procedures. In several instances, multiple NHSN procedure codes were mapped to a single SCIP procedure (Appendix A). This list of procedures is the same as those procedures specified in the HHS Action Plan as targets of SSI prevention.[7] However, there are notable differences between procedure groupings included in SCIP and those in this report. These include, but are not limited to, inclusion of both primary and revision hip arthroplasties in the NHSN hip arthroplasty procedure category (while only primary hip arthroplasty is included in the CMS SCIP grouping).

SSI SIRs were reported for the aggregate across all of these procedure types, as well as for each specific procedure category. Consistent with the HHS Action Plan, CDC further limits the SSIs included in this report to a subset of all SSIs reported as deep incisional and organ/space infections that were detected during the hospital admission where the operation was performed or upon readmission to that same hospital.[9] Superficial incisional SSIs and any SSIs identified through post-discharge surveillance were excluded in alignment with current recommendations for public reporting summary measures.[10]

Basic summary statistics of characteristics of reporting by hospitals are presented for each state and nationally. Data external to NHSN were required to compile some of these metrics. Specifically, CDC consulted with each state health department to verify the number of acute care facilities eligible for reporting to NHSN, date of implementation of any mandated reporting, and the performance of any external validation of the reported data. Validation included any data quality assessment of missing or implausible values and/or detection of outlier facilities (e.g., number of infections, rates, denominators), and/or audits of medical records. Information on validation efforts was requested from all states, regardless of presence of a legislative mandate for the particular HAI type. Some states without mandatory reporting of a given HAI have performed validation on NHSN data that is voluntarily shared with them by facilities.

Summary HAI Data and Calculation of SIRs

The referent period remained January 2006 through December 2008, as in previous SIR reports.[4] However, for CAUTI, the referent period is 2009. All facilities reporting at least 1 month of relevant data to NHSN during the referent time period (regardless of any mandate) were included in the referent period; these data are comparable to those reported in the NHSN annual report.[1,5] The SIRs represent comparisons of observed HAI occurrence during each distinct reporting period with the predicted occurrence based on the rates of infections among all facilities adjusting for key covariates (referent population). Illustrative examples of how an SIR is calculated are provided in previous reports (http://www.cdc.gov/HAI/surveillance/statesummary.html).[4] Although over 40 patient locations are represented in the referent time period,[1] during subsequent years, such as 2010, some facilities reported HAI data from location types not represented in the referent time period. In these scenarios, an SIR cannot include data from these new location types.

The CLABSI and CAUTI SIRs are adjusted for patient mix by type of patient care location, hospital affiliation with a medical school, and bed size of the patient care location. Other factors, such as hospital bed size, were not consistently associated with differences in CLABSI or CAUTI rates after accounting for patient location and, therefore, were not included in CLABSI SIR risk adjustment. For NICUs, the pooled mean umbilical catheter-associated BSI (UCAB) rate and the CLABSI infection rate within each of the five birth weight categories were used to determine the predicted number of device-associated BSIs from each reporting facility, referred to as CLABSIs for this report.[1] Of note, clinical sepsis (without

laboratory-confirmed bloodstream infection) was not included in the calculations of CLABSI during either the reporting period or referent period. CAUTIs are not reported from NICUs.

For SSI SIRs, risk models were constructed evaluating all available procedure-related risk factors (e.g., duration of surgery, surgical wound class, use of endoscopes, status as re-operation, patient age, and patient assessment at time of anesthesiology [ASA score]) to provide the best possible adjustment for differences in patient-mix within each type of surgery. These risk models were constructed specifically for this report to predict SSIs reported as deep incisional or organ/space infections and only those detected during admission or upon readmission to the same hospital.[2] A summary of the adjustment parameters are listed in Appendix A. As additional procedure-specific data become available to NHSN improved risk models can be constructed.

For the national and state SIR, all eligible data were included and the total number of infections predicted was compared to the number observed at each level of aggregation. Second, facility-specific SIRs were also calculated for each of the summary measures presented nationally. However, if a single facility's predicted number of HAIs (e.g., CLABSI) was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs. This report considered calculations of a facility-specific SIR as reliable only when at least one HAI would be predicted based on the data reported to NHSN from that facility. For the state-specific aggregation of HAI data, state-specific SIRs were not reported unless at least five facilities reported data. In addition, if fewer than 20 facilities had reliable facility-specific SIRs, then no key percentile distributions of facility-specific SIRs were calculated (such as occurred with abdominal aortic aneurysm repair at the national level) for that level of reporting. Because most states had sufficient reporting from facilities to calculate reliable state-specific SIRs, including roughly half with sufficient reporting to reliably calculate key percentile distributions, state-specific summary data is reported for all states.

An SIR of 1.0 should be interpreted as indicating that the number of events the entity (e.g., state health department, healthcare facility) observed is no different than if its experience had been the same as that of the referent population. Because the SIR is an estimate based on calculations of reported data, confidence intervals (CIs) are calculated to allow for accurate interpretation of the SIR. If these CIs include a value of 1.0, the SIR should be interpreted as if it were 1.0. The CI around the SIR depends on several factors, including the number of facilities reporting data from the relevant patient care locations, the number of device days or operative procedures that were reported, and the types of facilities reporting.

Serial Comparison of SIRs

The evaluation of progress in the prevention of HAIs was assessed by comparing the SIRs between sequential years. This was first accomplished by comparing the SIRs between each of the sequential reporting periods. A second sensitivity analysis was performed by restricting the reporting facilities to only those that reported during the initial reporting period, referred to as the change in SIR for continuously reporting facilities. A conditional binomial test was performed to assess statistically significant changes in the pairs of sequential SIRs (two-sided P-value ≤.05). If the change was not statistically significant, it was reported as "no change." Prevention success can be measured as sustained (similar SIRs between reporting periods), improved (SIRs sequentially decreasing), or slowing (SIRs sequentially increasing toward or above 1.0). Because data for this report uses all data reported to NHSN through October 5, 2011, calculations of the 2009 SIR will differ slightly from reports using datasets created earlier in time, including those reported by individual state health departments.

Results

Table 1 (Tables 1a, 1b, 1c) summarize the variability and extent of HAI reporting to NHSN for each CLABSI, CAUTI, and SSI by state, respectively. CLABSI data were reported from at least one facility in 49 states and Washington, D.C., and in only seven of these 49 did fewer than five facilities contribute CLABSI data. In many instances a large number of facilities reported data in states without mandates, and overall 2,403 facilities contributed CLABSI data in 2010 compared to 1,695 (50% increase) in 2009. These facilities reported CLABSI data from 8,904 different locations (3,760, 42% critical care; 4,215, 52% ward; 529, 6% NICU). CAUTI data were reported from at least one facility in 47 states and Washington, D.C., and in only 13 of these 47 did fewer than five facilities contribute data. Overall 1,097 facilities contributed CAUTI data in 2010. These facilities reported from 4,193 different locations (1,491, 36% critical care; 2,702, 64% ward). SSI data were reported in 45 states and Washington, D.C., from 1,385 facilities (an increase of 46% from the 946 facilities reporting in 2009). Ten states had fewer than five facilities reporting SSI data. Overall, 529,038 surgical procedures were reported in 2010 compared to 420,340 during 2009 (25% increase).

Table 2 displays metrics summarizing the HAI experience for the United States. The first overall CLABSI measures include all patient care locations including non-neonatal patient care locations (critical care and wards as defined in the methods) and NICUs; during 2010, 13,812 CLABSIs were reported compared to 20,184.815 predicted for an SIR of 0.684 (95% CI 0.673-0.696). This translates to about a 32% national reduction compared to the referent period. Individual facilities reported a wide range of facility-specific SIRs; half of all facilities reported an SIR <.56 (the median), and 90% of facilities reported SIRs <1.52. This represents an improvement compared to the previous report where about 10% of facilities were reporting SIRs > 1.99. When stratified by patient care area groupings, the SIRs were lowest among non-neonatal critical care locations (SIR 0.654), then NICUs (SIR 0.695), followed by wards (SIR 0.728). The SIR for NICUs is improved compared to the previous report of July-December 2009, where the SIR was reported as 0.86 (95% CI 0.80-0.93).[4] Of note, 14 facilities reported only data from the newly defined mixed acuity locations for which there are no comparisons in the referent time period to calculate SIRs; these facilities were excluded from analysis in Table 2, resulting in 2,389 facilities contributing CLABSI data to the overall CLABSI SIR.

For CAUTIs reported from all patient care areas (excluding NICUs), 9,995 CAUTIs were reported while 10,656.872 were predicted, resulting in an SIR of 0.938 (95% CI 0.920-0.993). A slightly higher SIR was observed among critical care locations (SIR 0.967, 95% CI 0.942-0.993) compared to ward locations (SIR 0.903, 95% CI 0.876-0.930). This translates into a reduction in CAUTIs of about 3% (ICUs) to 10% (ward locations) since 2009 (the referent period for CAUTI).

The national SSI SIR was summarized across the procedure types outlined previously and was limited to SSIs classified as deep incisional or organ/space infection and detected during admission or readmission to the same hospital in which the procedure was performed. For the overall national SSI SIR, 4,737 deep incisional or organ/space SSIs were reported during initial admission or upon readmission from 529,038 procedures; based on the various factors reported for these procedures, 5,170.309 would have been predicted (SIR 0.916, 95% CI 0.89-0.943). Nationally, this experience translates to an 8% reduction in the incidence of these SSIs among this group of procedures, similar to what was reported in the July-December 2009 SIR report.[4] Again, the facility-specific SIRs summarized in Table 2 demonstrate great variability; 25% of the

facilities reported an SIR >1.29 (75th percentile), that is, 29% more SSIs than would have been predicted, similar to the experience reported last year.

When procedure-specific SIRs were calculated, the number of procedures reported within each category was a small subset of the total. Also, the number of facilities contributing data to any of the procedure-specific SIRs varied considerably. This included lows of 21, 31, and 50 facilities reporting data on rectal surgery, abdominal aortic aneurysm repair, or peripheral vascular bypass surgery respectively, to a high of 966 reporting data on knee arthroplasty. The resulting procedure-specific SIRs range from 0.648 to 1.285. However, only three of the procedure-specific SIRs significantly differed from 1.0: knee arthroplasty (SIR 0.892, 95% CI 0.840-0.947), coronary artery bypass graft surgery (SIR 0.820, 95% CI 0.766-0.876), and colon surgery (SIR 0.909, 95% CI 0.853-0.968). This may be in part due to small sample sizes of some procedure-specific estimates or lack of successful prevention efforts for any of a variety of reasons.

Table 3 illustrates state-specific SIR. For the overall CLABSI SIR calculations (Table 3a) in 42 states and Washington, D.C., SIR could be calculated. In 35 of these sites the SIR was significantly lower than 1.0. In roughly half of these sites, over 20 facilities reported enough data to calculate a reliable facility-specific SIR, allowing some assessment of the variability in performance across a wide range of facilities. In several states, >10% of individual facilities have considerably high SIRs (e.g., >1.9). Critical care location-specific (Table 3b), ward-specific (Table 3c), and NICU-specific (Table 3d) SIRs illustrate a similar pattern, although these estimates are less precise due to fewer data in each strata. Of note, validation activities including an external authority performing a medical record audit (YES[a] in Table 1) occurred in 16 states reported in Table 3b, mostly among states with a mandate to report to NHSN. The SIRs from states reporting such validation reported summary SIRs (Table 3b) modestly higher than other states; however none were >1.0, one was no different than 1.0, and 15 were significantly <1.0. The median SIR among states reporting such validation efforts was 0.675 compared to the value of 0.654 for the entire United States.

Table 4 presents serial SIRs for specific states with sufficient data in both reporting periods, comparing 2009 to 2010. SIRs represent CLABSI from all locations. The columns under "All Reporters" include data from all facilities reporting in either of the reporting periods, while those under "Continuously Reporting Locations" represent data from only those locations and facilities reporting in both years. Of the 52 reporting sites, nine had insufficient data to report serial SIRs. Of the remaining 43, only two reported increased SIRs, neither of which was statistically significant when restricted to continuously reporting facilities. In contrast, 21 reported decreases in CLABSI SIR, of which 20 remained significant when restricted to continuously reporting locations.

Table 5 presents serial SIRs for national CLABSI and SSI data for 2009 compared to 2010. These data assess progress in preventing HAIs between two sequential reporting periods. SIRs for "All Reporters" include data reported from non-NICU critical care locations, wards, and NICUs. For CLABSI, the SIR significantly decreased between reporting periods, indicating improved reductions compared to 2009. This finding was confirmed when evaluating only those locations reporting in both periods. For SSI, serial SIRs were significantly lower in 2010 compared to 2009 for the overall SSI SIR of coronary artery bypass graft surgery and rectal surgery. However, this measure of improved prevention success was confirmed for only the latter two scenarios. Regarding rectal surgery, the metric is based on only the 11 facilities reporting during the two-year period. The remaining procedures, and all procedures combined, had

similar SIRs between the two years, but only knee arthroplasty, colon surgery, and coronary artery bypass graft surgery have SIRs <1.0 in 2010 and 2009 translating to successful reduction in SSIs (Table 4) compared to the baseline period.

Discussion

The HAI data summarized in this report demonstrate healthcare facilities reporting to NHSN during 2010, as a group, reported fewer CLABSIs (32%), CAUTIs (6%), and SSIs (8%) than predicted based on the case-mix of patients and locations that were monitored. Moreover, the CLABSI prevention success improved between reporting periods, as the SIR during 2010 was significantly decreased (SIR 0.684, 32% reduction in CLABSI) compared to 2009 (SIR 0.854, 15% reduction in CLABSI). This suggests that the facilities reporting during both years not only sustained the prevention success of 2009, but improved even more in 2010. Such improvement was more modest for SSIs: the overall SSI SIR decreased from 0.981 to 0.916 when including all reporting facilities, but the decrease lost statistical significance when limiting the comparison to only facilities reporting in both years. This may be a combination of a loss of power (only 904 facilities reported continuously in both years) and lack of substantial progress across all surgery types included. Regardless, there was sustained prevention success, with SIRs significantly lower than 1.0 in both 2009 and 2010. Interestingly, improved prevention success was observed among facilities reporting specifically on coronary artery bypass graft procedures (CABG), with a statistically significantly lower SIR in 2010 (0.820, 18% reduction) compared to that in 2009 (0.962, 4% reduction). While this demonstrates substantial and improved success in prevention of SSIs related to this procedure, there is opportunity for substantial SSI prevention in other procedures.

Another perspective on the potential improvements that could occur can be made by the evaluation of the facility-specific SIRs reported for each type of HAI, and in each of the major patient-location groups. In most cases, the calculated SIR for the highest 90th percentile of facilities reporting was >1.5, translating to over 50% more HAIs than would have been predicted based on the case-mix. If these worst performing facilities reduced their SIRs to about 1.0, great progress will be realized nationally.

Overall during 2010, 2,403 facilities reported CLABSI data to NHSN, an increase of about 800 facilities compared to the previous year. This increase may be the result of federal funding to support state-based HAI detection and prevention programs in the latter half of 2009. In addition, this increase also can be attributed to the advent of new CMS reporting requirements for hospitals participating in the CMS Hospital Inpatient Quality Reporting Program, which requires participating facilities to report to CMS through NHSN starting in 2011.[5] Summary data reported through NHSN to CMS as part of this program will be posted quarterly beginning early 2012. Because these data may be a subset of all data reported to NHSN (e.g., some facilities report to NHSN but do not participate in the CMS Reporting Program), the summary statistics are expected to vary slightly.

Regarding CLABSI prevention success regionally, almost half of the states reported CLABSI SIRs in 2010 significantly <1.0, confirming that the national progress has not been limited to select geographic areas. Furthermore, most of these states reported accelerated prevention success in 2010 compared to 2009.

Roughly 400 more facilities reported SSI data nationally in 2010 compared to 2009, when 946 reported SSI data. This is a reversal of the trend reported in 2009.[4] Much of this increase is due to state-specific mandates and facilities beginning to comply with CMS's Hospital Inpatient Quality Reporting Program, which required facilities to

report SSI data through NHSN starting in January 2012.[11] Although the number of facilities reporting increased, the proportion of total months of data that could have been submitted decreased slightly in 2010. This again may be due to facilities just entering into the system and reporting in the latter part of the calendar year.

A major consideration for interpretation of these data and for future reports is assessing the confidence in the validity of the data reported. First, specific validation efforts have been focused at the state level, and there is a need for more widespread validation of HAI data reported to NHSN. In this report, completion of validation studies of CLABSI data was reported from 16 states during 2009, and 21 in 2010; evaluations included data quality assessment of missing or implausible values and/or detection of outlier facilities (e.g., number of infections, rates, denominators) in all 21 states, and an audit of medical records in 16. Information on validation efforts was requested from all states, regardless of presence of a legislative mandate for the particular HAI type. Some states without mandatory reporting of a given HAI have performed validation on NHSN data that are voluntarily shared with them by facilities. Validation efforts by state health departments represent an important step toward a more complete understanding of the HAI data reported to NHSN. In previous SIR reports including state-specific data[4], validation activities including a medical record audit (YES[a] in Table 1) by an external authority were anecdotally noted to be associated with higher SIRs. This phenomena is less apparent in this report.

Regardless of the success of validation efforts, inherent variability in case findings of HAIs will occur between facilities, explaining some of the differences in observed infection rates and facility-specific SIRs. Several efforts are in place to improve the accuracy and confidence in these HAI data. These include the availability of web-based NHSN surveillance training modules (http://www.cdc.gov/nhsn/training.html), including webinars, slide sets, and new, self-paced, interactive, online training courses with continuing education credits available upon successful completion of an assessment; the provision of NHSN training during CDC-hosted events and at professional meetings and conferences; continued improvements to the NHSN system including software changes such as business rules and cross-field edit checks to prevent data entry errors, system alerts to inform users of missing data, and the availability of data quality reports to inform users of aberrant data. In addition, CDC is exploring changes in methodology to minimize unreliable application of the standard definitions and data collection protocols. Finally, CDC is developing guidance and tools for efficient validation work to be implemented by states as resources become available.

The SIRs summarize complex data related to HAIs in a single set of indicators that use national data for a specified time period as a common referent. The indirect standardization technique used to calculate SIRs is the same as for standardized mortality ratios (SMRs), a commonly used method in epidemiology for comparing mortality between a group and a referent population.[12] This summary measure should not be used to derive any absolute ranking of facilities or regions, but rather as a tool to identify facilities or regions that may deserve targeted evaluations, which may include validation efforts or assessing potential prevention programs.

When interpreting data in this report, it is important to understand the extent to which SIRs are risk adjusted. For device-associated infections, the risk stratification is mostly by the location of the patient, often split into different strata further by status as a teaching facility, and several times further split by number of beds in the location.[1] Additional data, such as hospital-level case-mix indices, or patient-specific device use data, may result in improved risk adjustment and are being

explored for incorporation into future evaluations. For SSIs, risk stratification includes procedure- and patient-specific factors.[2] Secondly, despite efforts through validation and training, infection prevention staff often interprets or implements surveillance methods differently. To minimize the variability in application of standardized methods, changes in NHSN methods are planned for 2013 and beyond. As these planned changes are finalized and implemented, their impact on our ability to report consistently over time will be an ongoing challenge.

Conclusion

This report presents a set of national summary statistics for CLABSIs, CAUTIs, and SSIs for 2010, including serial SIRs for CLABSI and SSI for 2009-2010. As a single summary measure of prevention success, there has been a large reduction (32%) in CLABSIs among reporting hospitals compared to predictions and more modest reductions for CAUTI and SSI. Prevention success improved in 2010 compared to the 2009 level of success for CLABSI. For SSI, improved prevention success over the two years was documented most significantly for coronary artery bypass graft operations (in 2010, 18% SSIs prevented), while stable reductions in SSIs were evident for two of the nine other operative procedures evaluated (knee arthroplasty, 11% reduction; colon surgery, 9% reduction). Overall, there appears to be great room for improvement across the variety of operative procedures. Serial comparisons of CLABSI at the state-level provide an improved means for monitoring the impact of interventions and indicate the successes of state-based and national HAI reduction efforts. Ongoing interactions with state health departments will be critical to determine ways to improve the reporting of HAIs and to act on these data to prevent HAIs. Although comparative data on HAIs (e.g., comparing the local facility to the referent group) are available to each participating facility at all times through the NHSN system, facility-specific SIRs have been used by an increasing number of state departments to present annual HAI summary.[13-20] CDC will continue to report SIRs at the national level as a measure of progress toward the HHS HAI Action Plan targets and to gauge the impact of federal support to the states for HAI prevention. However, first and foremost, these summary data add to a comprehensive body of data related to HAI occurrence for analysis and action at the local, state, and national levels.

References

1. Edwards J, Peterson KD, Mu W, Banerjee S, Allen-Bridson K, Morrell G, et al. National Healthcare Safety Network (NHSN) Report: Data Summary for 2006 through 2008, issued December 2009. Am J Infect Control. 2009 Dec;37(10):783-805. Available at: http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF. Accessed Mar 1, 2010.

2. Mu Y, Edwards JR, Horan TC, Berrios-Torres SI, Fridkin SK. Improving Risk-Adjusted Measures of Surgical Site Infection for the National Healthcare Safety Network. Infect Control Hosp Epidemiol 2011;32(10):970-986.

3. Hidron AI, Edwards JR, Patel J, Horan TC, Sievert DM, Pollock DA, Fridkin SK for the National Healthcare Safety Network Team and Participating National Healthcare Safety Network Facilities. Antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Netowrk at the CDC, 2006-2007. Infect Control Hosp Epidemiol 2008;29:996-1011.

4. Centers for Disease Control and Prevention. CDC's National Healthcare Safety Network (NHSN) Healthcare-associated Infections Summary Data Reports. Available at http://www.cdc.gov/HAI/surveillance/statesummary.html. Accessed Jan 3, 2012.

5. Dudeck MA, Horan TC, Peterson KD, Allen-Bridson K, Morrell GC, Pollock DA, and Edwards JR. National Healthcare Safety Network (NHSN) Report, Data Summary for 2009, Device-associated Module. AM J Infect Control. 2011 June; 39 (5): 349-67.

6. Centers for Disease Control and Prevention. Central Line-Associated Bloodstream Infection (CLABSI) Event. Available at: http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf. Accessed Jan 3, 2012.

7. Centers for Disease Control and Prevention. Catheter-Associated Urinary Tract Infection (CAUTI) Event. http://www.cdc.gov/nhsn/PDFs/pscManual/7pscCAUTIcurrent.pdf. Accessed Jan 3, 2012.

8. www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228760129036

9. US Department of Health and Human Services. Action Plan to Prevent Healthcare-Associated Infections. Washington, DC. 2009. Available at: www.hhs.gov/ophs/initiatives/hai/actionplan/index.html. Accessed Mar 1, 2010.

10. National Quality Forum. National Voluntary Consensus Standards for the Reporting of Healthcare-Associated Infection Data. Washington, DC: National Quality Forum, 2008. Available at: www.qualityforum.org/Publications/2008/03/National_Voluntary_Consensus_Standards_for_the_Reporting_of_Healthcare-Associated_Infection_Data.aspx. Accessed Oct 28, 2010.

11. Department of Health and Human Services, Centers for Medicare and Medicaid Services. 42 CFR Parts 412, 413, 415, et al. Medicare Program; Hospital Inpatient Prospective Payment Systems for Acute Care Hospitals and the Long-term Care Hospital Prospective Payment System Changes and FY2011 Rates; Provider Agreements and Supplier Approvals; and Hospital Conditions of Participation for Rehabilitation and Respiratory Care Services; Medicaid Program: Accreditation for Providers of Inpatient Psychiatric Services; Final Rule. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-19092.pdf. Accessed Oct 28, 2010.

12. Fleiss JL. Statistical Methods for Rates & Proportions. 2nd ed. John Wiley & Sons; 1981.

13. Templeton J, Roitman H, Colorado Health Facility Acquired Infections Advisory Committee. State of Colorado Status Report on the Health Facility Acquired Infections Disclosure Initiative. Colorado Department of Public Health and Environment. Available at: www.cdphe.state.co.us/hf/PatientSafety/Rev%202.4.09_daniels.pdf. Accessed Mar 1, 2010.

14. Massachusetts Executive Office of Health and Human Services Department of Public Health. Healthcare Associated Infection (HAI) in Massachusetts Acute Care Hospitals, July 1, 2008 – June 30, 2009. April 2010. Available at: http://www.mass.gov/eohhs/docs/dph/quality/healthcare/hai-report.pdf. Accessed Oct 28, 2010.

15. New Hampshire Department of Health and Human Services, Division of Public Health Services, Infectious Disease Surveillance Section. State of New Hampshire Healthcare-Associated Infections 2009 Report. August 16, 2010. Available at: www.dhhs.state.nh.us/dphs/cdcs/hai/documents/hai2009.pdf. Accessed Oct 28, 2010.

16. New York State Department of Health. Hospital-Acquired Infections, New York State 2009. September 1, 2010. Available at: www.health.state.ny.us/statistics/facilities/hospital/hospital_acquired_infections/2009/docs/hospital_acquired_infection.pdf. Accessed Oct 28, 2010.

17. 2008 Report: Healthcare-Associated Infections (HAI) in Pennsylvania Hospitals. Pennsylvania Department of Health. Available at: www.portal.state.pa.us/portal/server.pt/document/746426/2008_report_-_healthcare_associated_infections_in_pennsylvania_hospitals_-_2010-01-13_pdf. Accessed Mar 3, 2010.

18. South Carolina Department of Health and Environmental Control. 2009 Hospital Infections Disclosure Act (HIDA) Annual Report to the General Assembly on Hospital Acquired Infections. Available at: http://www.scdhec.gov/health/disease/hai/docs/2010%20HIDA%20Annual%20Report.pdf. Accessed Mar 1, 2010.

19. Tennessee's Report on Healthcare Associated Infections: January 1, 2008–December 31, 2010. Tennessee Department of Health. Available at: http://health.state.tn.us/ceds/PDFs/TNreportHAI0911.pdf. Accessed Jan 3, 2012.

20. State of New Hampshire Healthcare-Associated Infections 2010 Report. Available at: http://www.dhhs.state.nh.us/dphs/cdcs/hai/documents/hai2010.pdf. Accessed Jan 3, 2012.

Table 1a. Characteristics of facilities reporting to NHSN by State, 2009 and 2010: Central Line-associated Bloodstream Infections (CLABSI)

Table 1b. Characteristics of facilities reporting to NHSN by State, 2010: Catheter-associated Urinary Tract Infections (CAUTIs)

Table 1c. Characteristics of facilities reporting to NHSN by State, 2009 and 2010: Surgical Site Infection (SSI)

Table 2. National Standardized Infection Ratios (SIRs) and facility-specific percentiles using HAI data reported from all NHSN facilities reporting during 2010 by HAI and patient population: CLABSIs, CAUTIs, and SSIs

Table 3a. State-specific SIRs and facility-specific percentiles, NHSN facilities reporting during 2010: CLABSIs, all locations

Table 3b. State-specific SIRs and facility-specific percentiles, NHSN facilities reporting during 2010: CLABSIs, critical care locations

Table 3c. State-specific SIRs and facility-specific percentiles, NHSN facilities reporting during 2010: CLABSI, ward (non-critical care) locations

Table 3d. State-specific SIRs and facility-specific percentiles, NHSN facilities reporting during 2010: CLABSI, neonatal intensive care units

Table 4. Changes in State-specific SIRs, 2009 compared to 2010: CLABSI, all locations

Table 5. Changes in National Standardized Infection Ratios (SIRs), 2009 compared to 2010: CLABSI and SSI

Table 1a. Characteristics of facilities reporting to NHSN by State[1], 2009 and 2010: Central Line-associated Bloodstream Infections (CLABSI)[2]

State	No. of Facilities in State[3]	2009									2010								
				Healthcare Facilities Reporting to NHSN									Healthcare Facilities Reporting to NHSN						
							Locations (n)[2]									Locations (n)[2]			
		No. of Facilities Covered by Mandate[4]	Any Valid-ation[5]	No.	% [6]	Data Sub-mitted %[7]	Total	ICU	Wards[2]	NICU[8]	No. of Facilities Covered by Mandate[4]	Any Valid-ation[5]	No.	%[6]	Data Sub-mitted %[7]	Total	ICU	Wards[2]	NICU[8]
Alabama	122	0		1-4	<10.0	67.3	27	12	11	4	0		69	56.6	45.8	157	112	38	7
Alaska	29	0		1-4	<10.0	55.6	3	2	0	1	0		1-4	<20.0	81.3	4	3	0	1
Arizona	105	0		1-4	<10.0	100.0	4	4	0	0	0		24	22.9	63.7	53	42	10	1
Arkansas	105	0		6	5.7	59.6	20	12	7	1	0		22	21.0	52.2	42	29	9	4
California	383	0		139	36.3	73.1	461	220	206	35	M		367	95.8	74.0	2,239	546	1,567	126
Colorado	100	59	Yes	60	60.0	91.4	97	63	17	17	58	Yes[a]	60	60.0	82.2	107	64	26	17
Connecticut	42	30	Yes[a]	30	71.4	97.9	39	38	0	1	30	Yes[a]	30	71.4	91.5	41	38	0	3
Delaware	14	8	Yes	8	57.1	79.6	18	13	3	2	8	Yes	8	57.1	85.5	19	13	4	2
D.C.	16	0		1-4	<30.0	90.6	8	8	0	0	M	Yes	11	68.8	42.6	36	24	7	5
Florida	213	0		21	9.9	75.1	57	37	15	5	0	Yes	51	23.9	53.2	168	81	78	9
Georgia	172	0		16	9.3	78.4	69	40	23	6	0		37	21.5	67.4	154	67	76	11
Hawaii	28	0		1-4	<10.0	75.0	1	1	0	0	0		7	25.0	45.1	12	6	6	0
Idaho	52	0		1-4	<10.0	100.0	1	1	0	0	0		1-4	<10.0	40.3	6	2	3	1
Illinois	215	150	Yes	148	68.8	80.2	325	228	66	31	149	Yes[a]	148	68.8	87.4	349	227	84	38
Indiana	147	0		1-4	<10.0	75.5	18	9	7	2	0		34	23.1	51.1	95	48	41	6
Iowa	121	0		1-4	<10.0	70.2	7	5	2	0	0		25	20.7	40.4	39	28	9	2
Kansas	156	0		7	4.5	79.3	25	17	6	2	0		17	10.9	70.3	41	25	13	3
Kentucky	124	0		13	10.5	75.8	54	34	17	3	0		21	16.9	70.3	67	45	18	4
Louisiana	228*	0		10	4.4	85.0	56	19	32	5	0		31	13.6	52.5	93	43	40	10
Maine	36	0		1-4	<20.0	79.6	27	10	16	1	0		7	19.4	76.9	30	12	17	1
Maryland	70	45	Yes[a]	48	68.6	97.1	114	83	15	16	45	Yes[a]	47	67.1	81.1	143	85	41	17
Massachusetts	111*	73	Yes[a]	72	64.9	93.6	157	129	18	10	73	Yes[a]	71	64.0	95.1	151	123	18	10
Michigan	190	0		32	16.8	80.4	102	72	23	7	0		52	27.4	67.6	159	100	50	9
Minnesota	141	0		1-4	<10.0	43.8	4	4	0	0	0		1-4	<10.0	61.9	7	6	1	0
Mississippi	106	0		6	5.7	89.7	47	17	28	2	0		16	15.1	76.5	78	27	45	6
Missouri	156	0		8	5.1	90.6	16	12	2	2	0		13	8.3	90.5	28	18	6	4

Table 1a. Characteristics of facilities reporting to NHSN by State[1], 2009 and 2010: Central Line-associated Bloodstream Infections (CLABSI)[2] (Continued)

State	No. of Facilities in State[3]	2009									2010								
				Healthcare Facilities Reporting to NHSN									Healthcare Facilities Reporting to NHSN						
							Locations (n)[2]									Locations (n)[2]			
		No. of Facilities Covered by Mandate[4]	Any Valid-ation[5]	No.	% [6]	Data Sub-mitted %[7]	Total	ICU	Wards[2]	NICU[8]	No. of Facilities Covered by Mandate[4]	Any Valid-ation[5]	No.	%[6]	Data Sub-mitted %[7]	Total	ICU	Wards[2]	NICU[8]
Montana	61	0		5	8.2	92.9	7	5	1	1	0		10	16.4	73.1	30	11	16	3
Nebraska	92	0		1-4	<10.0	95.8	20	5	14	1	0		10	10.9	66.2	35	11	22	2
Nevada	59	0		1-4	<10.0	63.5	8	6	1	1	M		23	39.0	36.4	69	33	33	3
New Hampshire	26	25	Yes[a]	25	96.2	83.3	28	26	2	0	25	Yes[a]	24	92.3	86.3	31	26	5	0
New Jersey	111	72	Yes	72	64.9	96.6	160	136	4	20	72	Yes[a]	72	64.9	98.4	159	136	3	20
New Mexico	56	0		7	12.5	98.1	13	11	1	1	0	Yes[a]	18	32.1	57.0	49	24	23	2
New York	183	173	Yes[a]	183	100.0	94.1	475	377	44	54	182	Yes[a]	180	99.5	92.3	590	365	171	54
North Carolina	124	0		24	19.4	77.1	110	49	56	5	0	Yes[a]	39	31.4	67.5	163	79	76	8
North Dakota	50	0		1-4	<10.0	72.2	3	2	0	1	0		1-4	<10.0	68.8	8	3	4	1
Ohio	240	0		20	8.3	74.2	88	36	43	9	0		32	13.3	74.1	115	59	47	9
Oklahoma	149	51		51	34.2	82.8	76	68	7	1	51		51	34.2	90.5	107	70	34	3
Oregon	66	44	Yes[a]	47	71.2	84.1	73	58	14	1	42	Yes	48	72.7	82.4	79	59	19	1
Pennsylvania	251	251	Yes[a]	235	93.6	83.5	1,616	326	1,246	44	251	Yes[a]	226	90.0	83.5	1,586	317	1,223	46
Puerto Rico	65	0		0	0	.	.	.	.	.	0		0	0	.	.	.	.	.
Rhode Island	16	0		1-4	<10.0	58.3	1	1	0	0	0		1-4	<30.0	38.6	11	6	4	1
South Carolina	79	79	Yes[a]	72	91.1	58.1	433	106	324	3	79	Yes[a]	74	93.7	88.0	425	101	323	1
South Dakota	65*	0		0	0	.	.	.	.	.	0		1-4	<10.0	38.9	3	2	1	0
Tennessee	148	71	Yes[a]	78	52.7	92.4	192	149	17	26	80	Yes[a]	91	61.5	77.9	306	168	111	27
Texas	641	0		16	2.5	69.2	50	39	5	6	0		83	12.9	44.4	204	131	55	18
Utah	45	0		1-4	<10.0	8.3	1	1	0	0	0		1-4	<10.0	13.9	3	2	1	0
Vermont	13	8		8	61.5	95.5	11	10	0	1	8		8	61.5	94.2	10	10	0	0
Virginia	81	77	Yes	78	96.3	91.7	143	130	7	6	77	Yes[a]	81	100.0	84.9	203	136	60	7
Washington	106*	62	Yes[a]	64	58.5	89.3	112	81	15	16	62	Yes[a]	66	62.3	92.8	116	81	19	16
West Virginia	64	M	Yes	38	59.4	60.7	73	55	18	0	36	Yes	38	59.4	68.0	105	55	49	1
Wisconsin	137	0		13	9.5	81.2	43	21	17	5	0	Yes[a]	42	30.7	54.5	179	61	109	9
Wyoming	29	0		0	0	.	.	.	.	.	0		0	0	.	.	.	.	.
All U.S.	6,139			1,695	27.6	82.0	5,493	2,788	2,350	355			2,403	39.1	76.4	8,904	3,760	4,615	529

Table 1b. Characteristics of facilities reporting to NHSN by State[1], 2010: Catheter-associated Urinary Tract Infections (CAUTI)[2]

State	No. of Facilities[3]	NHSN Mandate[4]	Any Validation[5]	Healthcare Facilities Reporting to NHSN					
				No.	%[6]	Data Submission %[7]	Locations (n)[2]		
							Total	ICU	Wards[2]
Alabama	122			84	68.9	42.3	216	32	184
Alaska	29			1-4	<10.0	100.0	1	1	0
Arizona	105			9	8.6	50.0	20	12	8
Arkansas	105			8	7.6	63.1	14	5	9
California	383			73	20.6	76.2	231	91	140
Colorado	100			23	23.0	62.7	50	31	19
Connecticut	42			1-4	<10.0	77.4	7	7	0
Delaware	14			1-4	<30.0	73.1	9	6	3
D.C.	16			1-4	<20.0	35.8	10	5	5
Florida	213		Yes	35	16.4	46.7	132	55	77
Georgia	172			19	11.0	80.5	89	38	51
Hawaii	28			1-4	<10.0	91.7	1	1	0
Idaho	52			1-4	<10.0	55.0	5	2	3
Illinois	215			23	10.7	85.7	97	46	51
Indiana	147		Yes	36	24.5	50.0	90	35	55
Iowa	121		Yes	48	39.7	29.5	70	21	49
Kansas	156			15	9.6	76.6	31	23	8
Kentucky	124			12	9.7	72.3	44	29	15
Louisiana	228*			14	6.1	62.1	53	19	34
Maine	36			1-4	<10.0	93.0	19	5	14
Maryland	70			12	17.1	63.4	33	24	9
Massachusetts	111*			11	9.9	77.1	16	12	4
Michigan	190			24	12.6	69.4	89	38	51
Minnesota	141			1-4	<10.0	66.7	3	2	1
Mississippi	106			9	8.5	81.1	38	17	21
Missouri	156			7	4.5	91.1	16	10	6
Montana	61			9	14.8	82.4	27	9	18
Nebraska	92			6	6.5	76.0	26	7	19
Nevada	59			11	18.6	39.6	37	17	20
New Hampshire	26			1-4	<20.0	37.5	10	3	7
New Jersey	111	Yes	Yes	72	64.9	97.3	131	128	3
New Mexico	56			1-4	<10.0	41.7	5	4	1
New York	183			53	29.0	84.2	147	122	25
North Carolina	124		Yes[a]	22	17.8	71.0	93	36	57
North Dakota	50			1-4	<10.0	68.3	5	1	4
Ohio	240			17	7.1	84.2	68	26	42
Oklahoma	149			34	22.8	81.8	74	36	38
Oregon	66			15	22.7	92.9	39	21	18
Pennsylvania	251	Yes	Yes[a]	236	94.0	88.8	1,622	315	1,307
Puerto Rico	65			0	0	.	.	.	.
Rhode Island	16			0	0	.	.	.	.
South Carolina	79			10	12.7	81.3	28	6	22
South Dakota	65*			1-4	<10.0	38.9	3	2	1
Tennessee	148			14	9.5	78.7	47	23	24
Texas	641			19	3.0	39.7	64	28	36
Utah	45			0	0	.	.	.	.
Vermont	13			1-4	<10.0	97.2	3	3	0
Virginia	81			24	29.6	72.6	127	50	77
Washington	106*			28	26.4	87.8	52	37	15
West Virginia	64			13	20.3	64.6	72	18	54
Wisconsin	137			24	17.5	59.9	129	32	97
Wyoming	29			0	0	.	.	.	.
All U.S.	6,139			1,097	17.9	76.3	4,193	1,491	2,702

Table 1c. Characteristics of facilities reporting to NHSN by State[1], 2009 and 2010: Surgical Site Infection (SSI)

State	2009					2010				
			Healthcare Facilities Reporting to NHSN					Healthcare Facilities Reporting to NHSN		
	NHSN Mandate[4]	Any Validation[5]	No.	Data Submission %[7]	No. of Procedures Reported[9]	NHSN Mandate[4]	Any Validation[5]	No.	Data Submission %[7]	No. of Procedures Reported[9]
Alabama			1-4	75.0	1,643			64	41.4	7,560
Alaska			0	.	.			0	.	.
Arizona			1-4	77.1	2,829			6	70.8	3,789
Arkansas			1-4	38.9	594			6	54.2	862
California			46	65.9	17,439			63	63.5	23,449
Colorado	Yes	Yes	62	87.1	25,451	Yes	Yes[a]	61	91.5	29,799
Connecticut			1-4	97.2	2,054			1-4	88.9	1,791
Delaware			1-4	100.0	78	M		6	48.6	605
D.C.			1-4	16.7	1,098			1-4	38.9	849
Florida			8	93.8	3,110			24	62.2	5,526
Georgia			8	92.7	7,080			20	65.0	8,677
Hawaii			0	.	.			0	.	.
Idaho			1-4	54.2	302			1-4	72.2	647
Illinois			7	85.7	3,244	M	Yes	130	70.9	30,563
Indiana			1-4	95.8	3,017			6	75.0	3,324
Iowa			6	80.6	769			1-4	95.8	949
Kansas			1-4	94.4	1,484			8	70.8	2,702
Kentucky			7	67.9	2,204			1-4	94.4	1,738
Louisiana			1-4	93.8	1,743			5	78.3	1,808
Maine			1-4	100.0	1,080			1-4	100.0	1,265
Maryland			1-4	93.8	3,463	M	Yes[a]	45	54.3	13,868
Massachusetts	Yes	Yes[a]	68	96.2	35,692	Yes	Yes[a]	67	96.8	36,330
Michigan			20	87.1	11,436			23	85.5	14,342
Minnesota			1-4	100.0	3,088			6	48.6	2,640
Mississippi			1-4	100.0	2,640			10	76.7	3,751
Missouri			6	97.2	3,091			6	93.1	2,912
Montana			1-4	100.0	2,582			5	45.0	2,603
Nebraska			1-4	95.8	857			1-4	95.8	836
Nevada			1-4	100.0	756			8	42.7	2,009
New Hampshire	Yes	Yes[a]	26	91.4	6,185	Yes	Yes[a]	26	93.9	6,642
New Jersey	Yes	Yes	70	90.7	18,006	Yes	Yes	72	97.0	29,740
New Mexico			1-4	100.0	56			1-4	100.0	48
New York	Yes	Yes[a]	179	98.1	61,455	Yes	Yes[a]	179	97.4	61,355
North Carolina			18	87.5	9,010			20	77.1	5,672
North Dakota			0	.	.			1-4	50.0	314
Ohio			8	85.4	4,785			8	89.6	4,900
Oklahoma			8	61.5	2,938			8	82.3	4,169
Oregon	Yes	Yes[a]	49	85.2	18,289	Yes	Yes[a]	50	88.8	20,490
Pennsylvania	Yes	Yes[a]	171	92.4	95,820	Yes	Yes[a]	166	94.1	96,846
Puerto Rico			0	.	.			0	.	.
Rhode Island			0	.	.			0	.	.
South Carolina	Yes	Yes[a]	59	93.4	27,878	Yes	Yes[a]	59	92.0	26,562
South Dakota			0	.	.			0	.	.
Tennessee	Yes	Yes	25	90.7	11,235	Yes	Yes	69	62.9	16,409
Texas			1-4	54.2	138			24	34.4	2,481
Utah			0	.	.			0	.	.
Vermont	Yes		13	99.4	2,690	Yes		13	98.1	2,714
Virginia			1-4	100.0	1,217			19	57.5	3,696
Washington			15	84.4	10,168			44	80.3	27,039
West Virginia			5	41.7	631			5	58.3	578
Wisconsin			10	100.0	10,873			32	63.8	14,096
Wyoming			1-4	50.0	142			1-4	33.3	93
All U.S.			946	90.2	420,340			1,385	79.6	529,038

Footnotes for Tables 1a, 1b, and 1c:

1. United States, Washington, D.C., and Puerto Rico.

2. Data included in this report are from 2009 (CLABSIs, SSIs) and 2010 (CLABSIs, SSIs, CAUTIs) from acute care facility ICUs (critical care units), NICUs (see 9), and wards (for this report wards also include stepdown, specialty care areas [including hematology/oncology, bone marrow transplant], LTAC locations [or facilities]). Long term care facilities (skilled nursing facilities) and dialysis locations are not included in this report.

3. The number of acute care facilities reported to CDC by the state health department. Where indicated by a "*," this number was taken from the 2009 American Hospital Association survey of healthcare facilities and acknowledged by the state.

4. The number of acute care facilities eligible to report the HAI type under a mandate; for states in which a mandate exists to report that HAI type to the state health department using NHSN at the beginning of each reporting period. This number is reported to CDC by the state health department. If no mandate existed at the beginning of a reporting period, this number is zero. If no mandate existed at the beginning of a reporting period, but was implemented during the reporting period, the value of this column is "M" for midyear implementation. These values are presumed to be constant over sequential reporting periods unless update provided by state health department. Since mandates regarding surgical procedures vary greatly in type of procedure, the presence or absence of a mandate involving any surgical procedure for acute care facilities is indicated by Yes/No.

5. Yes indicates that the state health department reported the completion of any of the following validation studies of NHSN data reported during the reporting period: data quality assessment of missing or implausible values and/or detection of outlier facilities (e.g., number of infections, rates, denominators). Yes[a] indicates that the state completed one or both of these activities and also conducted an audit of medical records. Information on validation efforts was requested from all states, regardless of presence of a legislative mandate for the particular HAI type. Some states without mandatory reporting of a given HAI have performed validation on NHSN data that is voluntarily shared with them by facilities.

6. This measure is calculated using multiple data sets. It is calculated by dividing "No. of Healthcare Facilities Reporting" by "No. of Healthcare Facilities," and multiplying by 100. The denominator comes from either the state health department's self-reported data, or the 2009 AHA dataset. The numerator comes from the NHSN system, and includes all facilities for which data were reported for at least one month during the 12 month reporting period. For CLABSI, this does not include facilities for which zero central line-days were reported for all 12 months; for CAUTI this does not include facilities for which zero urinary catheter-days were reported for all 12 months; for SSI, this does not include facilities for which zero of the selected procedure types were performed for all 12 months. In states for which the AHA count is acknowledged by the state as the best estimate of number of healthcare facilities, this percentage assumes that all NHSN facilities are included in the AHA facilities count; that is, that the NHSN facilities are a subset of the AHA facilities. However, the AHA data do not necessarily comprise the total pool of facilities eligible to participate in NHSN. There are some AHA facilities that are not participating in NHSN; also, there are some facilities within the NHSN system that are not included in the AHA list. In states with a mandate to report HAI data using NHSN, some facilities in the number provided by the state health department (or in the AHA number) might not be included in mandate (e.g., facilities do not have the units or perform the procedures covered by the mandate; or the mandate covers only facilities above a certain bed size); or, some facilities included in the mandate might have reported zero central line-days, zero urinary catheter-days, or zero of the procedure types performed, for the full 12-month period.

7. This metric is the rate at which facilities submitted data to NHSN during the reporting period. It is calculated by dividing the number of months of data submitted to NHSN by the total number of months of data eligible to be submitted, and multiplying by 100. For CLABSI or CAUTI, a month in which zero device days were reported is not counted in the numerator; for SSI, a month in which zero of the procedure types were performed is not counted in the numerator. For SSI, this is calculated by dividing the number of months that at least 1 procedure was reported to NHSN by the total number of months any procedure could have been reported, multiplied by 100. For example, if a state has two facilities reporting to NHSN, then 24 total months of data could have been submitted to NHSN in a 12-month period. If those two facilities sent in 24 total months of data, the state participation percent is 100%. If one facility submitted data for 8 months and the other for 4 months, then the state participation percent is 50% (data were reported for 12 of 24 total months). For states with a mandate, it is possible for this percentage to be <100 for several reasons, including that some facilities reporting might not be covered by the mandate, might only be submitting selected months of data, or might not have had any central line-days, urinary catheter-days or performed any procedures in a given month to report.

8. NICU locations included are those classified by NHSN CDC location codes as Level II/III and Level III neonatal critical care areas. A Level II/III neonatal critical care area is defined by NHSN as: combined nursery housing both Level II and III newborns and infants. A Level III neonatal critical care area is defined by NHSN as: a hospital NICU organized with personnel and equipment to provide continuous life support and comprehensive care for extremely high-risk newborn infants and those with complex and critical illness. Level III is subdivided into four levels differentiated by the capability to provide advanced medical and surgical care.

9. SSIs included are those following select surgical procedures approximating procedures covered by SCIP, using NHSN-defined SSIs that were classified as deep incisional or organ/space, and were detected during admission or upon readmission. The SCIP procedures are listed in Appendix A.

Table 2. National Standardized Infection Ratios (SIRs) and facility-specific percentiles using HAI data reported from all NHSN facilities reporting during 2010 by HAI and patient population: Central Line-associated Bloodstream Infections (CLABSIs), Catheter-associated Urinary Tract Infections (CAUTIs), and Surgical Site Infections (SSIs)

HAI and Patient Population or Surgical Procedure	No. of Facilities Reporting		No. of Infections		SIR	95% CI for SIR		Facility-specific SIRs at Key Percentiles[1]				
			Observed	Predicted		Lower	Upper	10%	25%	Median (50%)	75%	90%
CLABSI, all[2]	2,389		13,812	20,184.815	0.684	0.673	0.696	0.000	0.232	0.564	0.961	1.525
ICUs[3]	2,140		7,206	11,020.512	0.654	0.639	0.669	0.000	0.197	0.538	0.947	1.531
Wards[4]	1,069		5,241	7,200.263	0.728	0.708	0.748	0.000	0.187	0.533	0.972	1.560
NICUs[5]	507		1,365	1,964.039	0.695	0.659	0.733	0.000	0.237	0.611	1.098	1.752
CAUTIs, all[6]	1,086		9,995	10,656.872	0.938	0.920	0.956	0.000	0.293	0.734	1.243	1.900
ICUs[3]	806		5,621	5,811.590	0.967	0.942	0.993	0.000	0.252	0.714	1.345	1.865
Wards[4]	688		4,374	4,845.282	0.903	0.876	0.930	0.000	0.271	0.725	1.229	1.967
		No. of Procedures										
SSI, combined procedures[7]	1,385	529,038	4,737	5,170.309	0.916	0.890	0.943	0.000	0.325	0.799	1.292	1.813
Hip arthroplasty	954	128,721	1,091	1,123.897	0.971	0.914	1.030	0.000	0.239	0.799	1.408	2.252
Knee arthroplasty	966	192,804	1,090	1,221.747	0.892	0.840	0.947	0.000	0.000	0.695	1.329	2.143
Coronary artery bypass graft[8]	425	79,612	868	1,058.919	0.820	0.766	0.876	0.000	0.000	0.569	1.170	1.955
Cardiac surgery	165	19,036	119	142.436	0.835	0.692	1.000	0.000	0.000	0.637	0.916	1.451
Peripheral vascular bypass surgery	50	2,575	63	67.379	0.935	0.718	1.196	0.281	0.493	0.895	1.221	1.550
Abdominal aortic aneurysm repair	31	492	5	7.715	0.648	0.255	1.363	.	.	.	.	.
Colon surgery	462	37,383	971	1,067.917	0.909	0.853	0.968	0.000	0.257	0.788	1.367	1.871
Rectal surgery	21	685	28	21.792	1.285	0.854	1.857	0.000	0.000	1.141	1.771	2.289
Abdominal hysterectomy	604	54,113	407	382.109	1.065	0.964	1.174	0.000	0.000	0.765	1.594	2.526
Vaginal hysterectomy	233	13,617	95	76.398	1.243	1.006	1.520	0.000	0.359	0.906	1.177	1.991

Footnotes for Table 2:

1. To improve estimating SIR distributions, facility-specific key percentiles were only calculated for patient populations or surgical procedures in which ≥20 facilities had a predicted number of HAIs (e.g., CLABSIs, CAUTIs, or SSIs) ≥1 during the reporting period. If a single facility's predicted number of HAIs was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs.
2. Data from all ICUs, wards (and other non-critical care locations), NICUs, and LTAC locations (or facilities).
3. Data from all ICUs; excludes wards (and other non-critical care locations), NICUs, and LTAC locations (or facilities).
4. Data from all wards (for this table wards also include stepdown, specialty care areas [including hematology/oncology, bone marrow transplant], and LTAC locations [or facilities]).
5. Data from all NICU locations, including Level II/III and Level III nurseries. For purposes of this report, both umbilical-line and central line-associated bloodstream infections are considered CLABSIs.
6. Data from all ICUs, wards (and other non-critical care locations), and LTAC locations (or facilities).
7. SSIs included are those following select surgical procedures approximating procedures covered by SCIP, using only SSIs that were classified as deep incisional or organ/space, and detected upon admission or readmission. (Specific NHSN procedures are listed in Appendix A.)
8. Coronary artery bypass graft includes procedures with either chest only or chest and donor site incisions.

Table 3a. State-specific Standardized Infection Ratios (SIRs) and facility-specific percentiles, NHSN facilities reporting during 2010:

Central Line-associated Bloodstream Infections (CLABSI), All Locations[1]

State	No. of Facilities Reporting	No. of Infections			95% CI for SIR		Facility-specific SIRs at Key Percentiles[2]				
		Observed	Predicted	SIR	Lower	Upper	10%	25%	Median (50%)	75%	90%
Alabama	69	280	254.957	1.098	0.973	1.235	0.000	0.081	0.754	1.348	2.119
Alaska	1-4	.	.	.	.	.	.	.	.	.	.
Arizona	24	168	195.617	0.859	0.734	0.999	0.267	0.426	0.883	1.471	1.911
Arkansas	22	91	159.006	0.572	0.461	0.703	.	.	.	.	.
California	365	2910	4,516.662	0.644	0.621	0.668	0.000	0.191	0.495	0.809	1.328
Colorado	60	204	308.068	0.662	0.574	0.760	0.000	0.224	0.601	1.047	1.445
Connecticut	30	100	146.003	0.685	0.557	0.833	0.000	0.370	0.619	1.083	1.347
Delaware	8	78	86.346	0.903	0.714	1.127	.	.	.	.	.
D.C.	11	75	109.505	0.685	0.539	0.859	.	.	.	.	.
Florida	51	278	368.542	0.754	0.668	0.848	0.000	0.098	0.685	0.963	1.347
Georgia	36	274	339.935	0.806	0.713	0.907	0.000	0.335	0.682	1.044	1.953
Hawaii	6	15	16.149	0.929	0.519	1.532	.	.	.	.	.
Idaho	1-4	.	.	.	.	.	.	.	.	.	.
Illinois	147	689	1,016.152	0.678	0.628	0.731	0.000	0.159	0.564	0.920	1.450
Indiana	34	185	177.977	1.039	0.895	1.201	.	.	.	.	.
Iowa	25	15	34.871	0.430	0.241	0.710	.	.	.	.	.
Kansas	15	71	123.820	0.573	0.448	0.723	.	.	.	.	.
Kentucky	21	97	147.884	0.656	0.532	0.800	.	.	.	.	.
Louisiana	31	87	109.111	0.797	0.639	0.984	.	.	.	.	.
Maine	7	55	60.608	0.907	0.684	1.181	.	.	.	.	.
Maryland	47	370	404.467	0.915	0.824	1.013	0.106	0.395	0.737	1.315	1.854
Massachusetts	70	284	490.744	0.579	0.513	0.650	0.000	0.000	0.575	0.888	1.700
Michigan	51	183	444.985	0.411	0.354	0.475	0.000	0.074	0.379	0.547	0.736
Minnesota	1-4	.	.	.	.	.	.	.	.	.	.
Mississippi	16	167	213.919	0.781	0.667	0.908	.	.	.	.	.
Missouri	13	114	151.582	0.752	0.620	0.903	.	.	.	.	.
Montana	10	18	38.308	0.470	0.278	0.743	.	.	.	.	.
Nebraska	10	124	142.636	0.869	0.723	1.037	.	.	.	.	.
Nevada	23	110	143.003	0.769	0.632	0.927	.	.	.	.	.
New Hampshire	24	28	50.266	0.557	0.370	0.805	.	.	.	.	.
New Jersey	72	439	554.943	0.791	0.719	0.869	0.000	0.351	0.737	1.292	1.690
New Mexico	18	42	98.423	0.427	0.308	0.577	.	.	.	.	.
New York	180	1,390	1,619.639	0.858	0.814	0.905	0.000	0.434	0.814	1.165	1.882
North Carolina	39	275	387.516	0.710	0.628	0.799	.	.	.	.	.
North Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Ohio	32	219	374.245	0.585	0.510	0.668	0.000	0.282	0.437	0.828	1.189
Oklahoma	51	163	301.139	0.541	0.461	0.631	0.000	0.000	0.437	0.748	0.842
Oregon	48	77	156.665	0.491	0.388	0.614	0.000	0.000	0.457	0.720	0.836
Pennsylvania	224	1559	2,938.275	0.531	0.505	0.558	0.000	0.230	0.483	0.770	1.158
Puerto Rico	0	.	.	.	.	.	.	.	.	.	.
Rhode Island	1-4	.	.	.	.	.	.	.	.	.	.
South Carolina	73	685	796.960	0.860	0.796	0.926	0.000	0.320	0.749	1.123	1.525
South Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Tennessee	91	772	868.024	0.889	0.828	0.954	0.211	0.383	0.676	1.115	1.662
Texas	82	265	414.920	0.639	0.564	0.720	0.000	0.000	0.332	0.879	1.499
Utah	1-4	.	.	.	.	.	.	.	.	.	.
Vermont	8	17	21.751	0.782	0.455	1.251	.	.	.	.	.
Virginia	81	372	553.155	0.673	0.606	0.744	0.000	0.000	0.430	0.829	1.496
Washington	65	185	381.068	0.485	0.418	0.561	0.000	0.034	0.420	0.685	1.174
West Virginia	38	79	163.487	0.483	0.383	0.602	0.000	0.000	0.434	0.648	1.513
Wisconsin	42	160	226.956	0.705	0.600	0.823	0.000	0.393	0.658	0.887	1.484
Wyoming	0	.	.	.	.	.	.	.	.	.	.
All U.S.	2,389	13,812	20,184.815	0.684	0.673	0.696	0.000	0.232	0.564	0.961	1.525

Footnotes for Table 3a:

1. Data from all ICUs, wards (for this table wards also include stepdown, specialty care areas [including hematology/oncology, bone marrow transplant], and LTAC locations [or facilities]), and NICUs.

2. To improve estimating SIR distributions, facility-specific key percentiles were only calculated for states in which ≥20 facilities had a predicted number of CLABSIs ≥1.0 during the reporting period. If a single facility's predicted number of CLABSIs was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs.

Table 3b. State-specific Standardized Infection Ratios (SIRs) and facility-specific percentiles, NHSN facilities reporting during 2010:

Central Line-associated Bloodstream Infections (CLABSI), Critical Care Locations[1]

States with NHSN mandates[3]	No. of Facilities Reporting	No. of Infections			95% CI for SIR		Facility-specific SIRs at Key Percentiles[2]				
		Observed	Predicted	SIR	Lower	Upper	10%	25%	Median (50%)	75%	90%
California	313	1093	1,758.910	0.621	0.585	0.659	0.000	0.175	0.502	0.883	1.368
Colorado	49	120	175.690	0.683	0.566	0.817	0.000	0.212	0.563	1.051	1.472
Connecticut	30	99	131.284	0.754	0.613	0.918	0.000	0.370	0.679	1.083	1.347
Delaware	8	53	62.242	0.852	0.638	1.114	.	.	.	.	.
D.C.	10	49	83.867	0.584	0.432	0.772	.	.	.	.	.
Illinois	143	433	648.729	0.667	0.606	0.733	0.000	0.263	0.560	0.929	1.475
Maryland	47	316	309.228	1.022	0.912	1.141	0.131	0.338	0.737	1.383	1.854
Massachusetts	69	212	413.632	0.513	0.446	0.586	0.000	0.000	0.483	0.872	1.556
Nevada	17	99	96.349	1.028	0.835	1.251	.	.	.	.	.
New Hampshire	24	20	45.696	0.438	0.267	0.676	.	.	.	.	.
New Jersey	72	334	462.578	0.722	0.647	0.804	0.000	0.345	0.602	1.127	1.690
New York	179	872	1,115.107	0.782	0.731	0.836	0.000	0.344	0.697	1.121	1.757
Oklahoma	48	111	231.035	0.480	0.395	0.579	0.000	0.000	0.302	0.753	0.884
Oregon	47	67	141.241	0.474	0.368	0.602	0.000	0.037	0.493	0.727	0.847
Pennsylvania	158	500	1,100.054	0.455	0.416	0.496	0.000	0.148	0.395	0.731	1.026
South Carolina	52	219	257.750	0.850	0.741	0.970	0.000	0.298	0.711	1.390	2.373
Tennessee	81	418	498.199	0.839	0.761	0.923	0.091	0.377	0.538	0.956	1.853
Vermont	8	17	21.751	0.782	0.455	1.251	.	.	.	.	.
Virginia	79	264	391.602	0.674	0.595	0.761	0.000	0.000	0.509	0.834	1.551
Washington	63	133	280.644	0.474	0.397	0.562	0.000	0.000	0.385	0.697	1.138
West Virginia	37	66	126.832	0.520	0.402	0.662	.	.	.	.	.
States without NHSN mandates											
Alabama	67	180	176.402	1.020	0.877	1.181	0.000	0.105	0.754	1.263	2.136
Alaska	1-4	.	.	.	.	.	.	.	.	.	.
Arizona	20	137	163.679	0.837	0.703	0.989	.	.	.	.	.
Arkansas	18	60	97.445	0.616	0.470	0.793	.	.	.	.	.
Florida	44	118	174.322	0.677	0.560	0.811	0.000	0.000	0.487	0.781	1.147
Georgia	33	131	203.150	0.645	0.539	0.765	0.000	0.197	0.672	0.844	1.031
Hawaii	5	8	15.047	0.532	0.230	1.048	.	.	.	.	.
Idaho	1-4	.	.	.	.	.	.	.	.	.	.
Indiana	31	81	77.730	1.042	0.828	1.295	.	.	.	.	.
Iowa	21	15	30.185	0.497	0.278	0.820	.	.	.	.	.
Kansas	13	42	75.048	0.560	0.403	0.756	.	.	.	.	.
Kentucky	20	58	97.251	0.596	0.453	0.771	.	.	.	.	.
Louisiana	27	35	58.208	0.601	0.419	0.836	.	.	.	.	.
Maine	6	27	26.212	1.030	0.679	1.499	.	.	.	.	.
Michigan	48	131	328.728	0.399	0.333	0.473	0.000	0.000	0.334	0.525	0.666
Minnesota	1-4	.	.	.	.	.	.	.	.	.	.
Mississippi	13	88	81.074	1.085	0.871	1.337	.	.	.	.	.
Missouri	10	48	79.793	0.602	0.444	0.798	.	.	.	.	.
Montana	9	6	15.381	0.390	0.143	0.849	.	.	.	.	.
Nebraska	9	25	29.653	0.843	0.545	1.245	.	.	.	.	.
New Mexico	18	30	68.114	0.440	0.297	0.629	.	.	.	.	.
North Carolina	32	116	192.153	0.604	0.499	0.724	.	.	.	.	.
North Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Ohio	26	81	171.337	0.473	0.375	0.588	0.000	0.276	0.485	0.843	0.980
Puerto Rico	0	.	.	.	.	.	.	.	.	.	.
Rhode Island	1-4	.	.	.	.	.	.	.	.	.	.
South Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Texas	78	168	320.165	0.525	0.448	0.610	0.000	0.000	0.315	0.708	1.211
Utah	1-4	.	.	.	.	.	.	.	.	.	.
Wisconsin	42	100	132.953	0.752	0.612	0.915	0.000	0.393	0.629	0.948	1.436
Wyoming	0	.	.	.	.	.	.	.	.	.	.
All U.S.	2,140	7,206	11,020.512	0.654	0.639	0.669	0.000	0.197	0.538	0.947	1.531

Footnotes for Table 3b:

1. Data from all ICUs; excludes wards (and other non-critical care locations), NICUs, and LTACs.
2. To improve estimating SIR distributions, facility-specific key percentiles were only calculated for states in which ≥20 facilities had a predicted number of CLABSIs ≥1.0 during the reporting period. If a single facility's predicted number of CLABSIs was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs.
3. Mandate to report CLABSIs to state health department using NHSN in place on January 1, 2010, or was implemented during 2010.

Table 3c. State-specific Standardized Infection Ratios (SIRs) and facility-specific percentiles, NHSN facilities reporting during 2010: Central Line-associated Bloodstream Infections (CLABSI), Ward (non-critical care) Locations[1]

State	No. of Facilities Reporting	No. of Infections		95% CI for SIR			Facility-specific SIRs at Key Percentiles [2]				
		Observed	Predicted	SIR	Lower	Upper	10%	25%	Median (50%)	75%	90%
Alabama	13	65	50.280	1.293	0.998	1.648	.	.	.	.	.
Alaska	0	.	.	.	.	.	.	.	.	.	.
Arizona	5	29	30.549	0.949	0.636	1.363	.	.	.	.	.
Arkansas	6	13	33.997	0.382	0.204	0.654	.	.	.	.	.
California	355	1640	2,395.747	0.685	0.652	0.718	0.000	0.124	0.474	0.888	1.499
Colorado	16	55	81.682	0.673	0.507	0.876	.	.	.	.	.
Connecticut	0	.	.	.	.	.	.	.	.	.	.
Delaware	1-4	.	.	.	.	.	.	.	.	.	.
Dist. of Columbia	1-4	.	.	.	.	.	.	.	.	.	.
Florida	21	138	160.285	0.861	0.723	1.017	.	.	.	.	.
Georgia	15	91	96.008	0.948	0.763	1.164	.	.	.	.	.
Hawaii	1-4	.	.	.	.	.	.	.	.	.	.
Idaho	1-4	.	.	.	.	.	.	.	.	.	.
Illinois	25	135	184.122	0.733	0.615	0.868	.	.	.	.	.
Indiana	9	89	77.356	1.151	0.924	1.416	.	.	.	.	.
Iowa	6	0	4.611	0.000	.	0.800	.	.	.	.	.
Kansas	6	28	42.784	0.654	0.435	0.946	.	.	.	.	.
Kentucky	6	27	29.689	0.909	0.599	1.323	.	.	.	.	.
Louisiana	13	34	35.634	0.954	0.661	1.333	.	.	.	.	.
Maine	1-4	.	.	.	.	.	.	.	.	.	.
Maryland	8	12	22.324	0.538	0.278	0.939	.	.	.	.	.
Massachusetts	8	35	32.419	1.080	0.752	1.502	.	.	.	.	.
Michigan	15	19	73.290	0.259	0.156	0.405	.	.	.	.	.
Minnesota	1-4	.	.	.	.	.	.	.	.	.	.
Mississippi	6	56	108.919	0.514	0.388	0.668	.	.	.	.	.
Missouri	1-4	.	.	.	.	.	.	.	.	.	.
Montana	5	11	20.990	0.524	0.262	0.938	.	.	.	.	.
Nebraska	6	90	106.831	0.842	0.677	1.036	.	.	.	.	.
Nevada	17	7	38.020	0.184	0.074	0.379	.	.	.	.	.
New Hampshire	1-4	.	.	.	.	.	.	.	.	.	.
New Jersey	1-4	.	.	.	.	.	.	.	.	.	.
New Mexico	11	6	17.861	0.336	0.123	0.731	.	.	.	.	.
New York	24	334	274.692	1.216	1.089	1.354	0.704	0.828	1.079	1.539	1.964
North Carolina	18	142	150.290	0.945	0.796	1.114	.	.	.	.	.
North Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Ohio	14	133	168.594	0.789	0.660	0.935	.	.	.	.	.
Oklahoma	8	44	56.099	0.784	0.570	1.053	.	.	.	.	.
Oregon	9	4	8.905	0.449	0.122	1.150	.	.	.	.	.
Pennsylvania	223	933	1,694.050	0.551	0.516	0.587	0.000	0.187	0.489	0.841	1.093
Puerto Rico	0	.	.	.	.	.	.	.	.	.	.
Rhode Island	1-4	.	.	.	.	.	.	.	.	.	.
South Carolina	72	457	527.788	0.866	0.788	0.949	0.000	0.284	0.739	1.121	1.339
South Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Tennessee	34	280	262.185	1.068	0.947	1.201	0.000	0.206	0.637	1.083	1.685
Texas	16	44	45.505	0.967	0.702	1.298	.	.	.	.	.
Utah	1-4	.	.	.	.	.	.	.	.	.	.
Vermont	0	.	.	.	.	.	.	.	.	.	.
Virginia	11	85	113.290	0.750	0.599	0.928	.	.	.	.	.
Washington	8	28	44.554	0.628	0.418	0.908	.	.	.	.	.
West Virginia	11	13	36.598	0.355	0.189	0.607	.	.	.	.	.
Wisconsin	24	44	73.939	0.595	0.432	0.799	.	.	.	.	.
Wyoming	0	.	.	.	.	.	.	.	.	.	.
All U.S.	1,069	5,241	7,200.263	0.728	0.708	0.748	0.000	0.187	0.533	0.972	1.560

Footnotes for Table 3c:

1. Data from all wards (for this table wards also include stepdown, specialty care areas [including hematology/oncology, bone marrow transplant], and LTAC locations [or facilities]); excludes NICUs and other critical care locations.

2. To improve estimating SIR distributions, facility-specific key percentiles were only calculated for states in which ≥20 facilities had a predicted number of CLABSIs ≥1.0 during the reporting period. If a single facility's predicted number of CLABSIs was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs.

Table 3d. State-specific Standardized Infection Ratios (SIRs) and facility-specific percentiles, NHSN facilities reporting during 2010: Central Line-associated Bloodstream Infections (CLABSI), Neonatal Intensive Care Units (NICUs)[1]

State	No. of Facilities Reporting	No. of Infections			95% CI for SIR		Facility-specific SIRs at Key Percentiles[2]				
		Observed	Predicted	SIR	Lower	Upper	10%	25%	Median (50%)	75%	90%
Alabama	7	35	28.274	1.238	0.862	1.722	.	.	.	.	.
Alaska	1-4	.	.	.	.	.	.	.	.	.	.
Arizona	1-4	.	.	.	.	.	.	.	.	.	.
Arkansas	1-4	.	.	.	.	.	.	.	.	.	.
California	121	177	362.005	0.489	0.420	0.567	0.000	0.000	0.338	0.805	1.271
Colorado	17	29	50.697	0.572	0.383	0.822	.	.	.	.	.
Connecticut	1-4	.	.	.	.	.	.	.	.	.	.
Delaware	1-4	.	.	.	.	.	.	.	.	.	.
D.C.	5	5	14.975	0.334	0.108	0.779	.	.	.	.	.
Florida	8	22	33.935	0.648	0.406	0.982	.	.	.	.	.
Georgia	10	52	40.778	1.275	0.952	1.672	.	.	.	.	.
Hawaii	0	.	.	.	.	.	.	.	.	.	.
Idaho	1-4	.	.	.	.	.	.	.	.	.	.
Illinois	38	121	183.300	0.660	0.548	0.789	0.000	0.000	0.504	0.758	1.338
Indiana	6	15	22.891	0.655	0.366	1.081	.	.	.	.	.
Iowa	1-4	.	.	.	.	.	.	.	.	.	.
Kansas	1-4	.	.	.	.	.	.	.	.	.	.
Kentucky	1-4	.	.	.	.	.	.	.	.	.	.
Louisiana	10	18	15.270	1.179	0.698	1.863	.	.	.	.	.
Maine	1-4	.	.	.	.	.	.	.	.	.	.
Maryland	17	42	72.915	0.576	0.415	0.779	.	.	.	.	.
Massachusetts	10	37	44.693	0.828	0.583	1.141	.	.	.	.	.
Michigan	8	33	42.966	0.768	0.529	1.079	.	.	.	.	.
Minnesota	0	.	.	.	.	.	.	.	.	.	.
Mississippi	6	23	23.926	0.961	0.609	1.442	.	.	.	.	.
Missouri	1-4	.	.	.	.	.	.	.	.	.	.
Montana	1-4	.	.	.	.	.	.	.	.	.	.
Nebraska	1-4	.	.	.	.	.	.	.	.	.	.
Nevada	1-4	.	.	.	.	.	.	.	.	.	.
New Hampshire	0	.	.	.	.	.	.	.	.	.	.
New Jersey	20	96	84.930	1.130	0.916	1.380	.	.	.	.	.
New Mexico	1-4	.	.	.	.	.	.	.	.	.	.
New York	54	184	229.840	0.801	0.689	0.925	0.000	0.432	0.695	1.237	2.338
North Carolina	7	17	45.074	0.377	0.220	0.604	.	.	.	.	.
North Dakota	1-4	.	.	.	.	.	.	.	.	.	.
Ohio	1-4	.	.	.	.	.	.	.	.	.	.
Oklahoma	1-4	.	.	.	.	.	.	.	.	.	.
Oregon	1-4	.	.	.	.	.	.	.	.	.	.
Pennsylvania	43	126	144.170	0.874	0.728	1.041	0.100	0.296	0.725	1.184	2.028
Puerto Rico	0	.	.	.	.	.	.	.	.	.	.
Rhode Island	1-4	.	.	.	.	.	.	.	.	.	.
South Carolina	1-4	.	.	.	.	.	.	.	.	.	.
South Dakota	0	.	.	.	.	.	.	.	.	.	.
Tennessee	25	74	107.640	0.687	0.540	0.863	.	.	.	.	.
Texas	18	53	49.250	1.076	0.806	1.408	.	.	.	.	.
Utah	0	.	.	.	.	.	.	.	.	.	.
Vermont	0	.	.	.	.	.	.	.	.	.	.
Virginia	7	23	48.263	0.477	0.302	0.715	.	.	.	.	.
Washington	16	24	55.870	0.430	0.275	0.639	.	.	.	.	.
West Virginia	1-4	.	.	.	.	.	.	.	.	.	.
Wisconsin	8	16	20.065	0.797	0.455	1.295	.	.	.	.	.
Wyoming	0	.	.	.	.	.	.	.	.	.	.
All U.S.	507	1,365	1,964.039	0.695	0.659	0.733	0.000	0.237	0.611	1.098	1.752

Footnotes for Table 3d:

1. Data from all NICU locations, including Level II/III and Level III nurseries. For purposes of this report, both umbilical line and central line-associated bloodstream infections are considered CLABSIs.

2. To improve estimating SIR distributions, facility-specific key percentiles were only calculated for states in which ≥20 facilities had a predicted number of CLABSIs ≥1.0 during the reporting period. If a single facility's predicted number of CLABSIs was <1.0, a facility-specific SIR was neither calculated nor included in the determinations of the distribution of facility-specific SIRs.

Table 4. Changes in State-specific Standardized Infection Ratios (SIRs) 2009 compared to 2010: Central Line-associated Bloodstream Infections (CLABSI), All Locations[1]

State	All Reporters[2]				Continuous Reporters		
	2009	2010	Significant Change	p-value	No. of Continuous Reporters[3]	Significant Change	p-value[4]
Alabama	1.228	1.098	No	0.3296	4	No	0.3317
Alaska	.	.	.	.	.	.	.
Arizona	0.443	0.859	Increase	0.0106	2	No	0.8586
Arkansas	0.572	0.572	No	1.0000	6	No	0.7431
California	0.856	0.644	Decrease	0.0000	133	Decrease	0.0000
Colorado	0.828	0.662	Decrease	0.0182	60	Decrease	0.0182
Connecticut	0.873	0.685	No	0.0754	30	No	0.0754
Delaware	0.607	0.903	Increase	0.0358	7	No	0.0650
Dist. of Columbia	0.476	0.685	No	0.1343	4	No	0.7840
Florida	1.142	0.754	Decrease	0.0000	20	Decrease	0.0003
Georgia	0.982	0.806	Decrease	0.0266	15	Decrease	0.0441
Hawaii	1.684	0.929	No	0.2504	1	No	0.5636
Idaho	.	.	.	.	.	.	.
Illinois	0.869	0.678	Decrease	0.0000	145	Decrease	0.0000
Indiana	1.224	1.039	No	0.1896	4	No	0.1375
Iowa	0.596	0.430	No	0.4860	3	No	1.0000
Kansas	0.644	0.573	No	0.5409	7	No	0.5318
Kentucky	0.716	0.656	No	0.5708	11	No	0.8819
Louisiana	0.721	0.797	No	0.5459	10	No	0.6803
Maine	1.263	0.907	No	0.0639	2	No	0.0640
Maryland	1.290	0.915	Decrease	0.0000	47	Decrease	0.0000
Massachusetts	0.727	0.579	Decrease	0.0043	70	Decrease	0.0043
Michigan	0.467	0.411	No	0.2402	31	No	0.2546
Minnesota	.	.	.	.	.	.	.
Mississippi	1.040	0.781	Decrease	0.0125	6	Decrease	0.0138
Missouri	0.807	0.752	No	0.6195	8	No	0.7181
Montana	0.539	0.470	No	0.8181	5	No	0.8151
Nebraska	1.146	0.869	Decrease	0.0259	3	Decrease	0.0131
Nevada	1.572	0.769	Decrease	0.0000	2	No	0.6651
New Hampshire	0.673	0.557	No	0.5080	24	No	0.5080
New Jersey	0.779	0.791	No	0.8379	72	No	0.8379
New Mexico	0.376	0.427	No	0.7026	7	No	0.7913
New York	1.029	0.858	Decrease	0.0000	178	Decrease	0.0000
North Carolina	1.124	0.710	Decrease	0.0000	21	Decrease	0.0000
North Dakota	.	.	.	.	.	.	.
Ohio	0.773	0.585	Decrease	0.0031	20	Decrease	0.0041
Oklahoma	0.554	0.541	No	0.8599	50	No	0.9064
Oregon	0.695	0.491	Decrease	0.0179	46	Decrease	0.0252
Pennsylvania	0.711	0.531	Decrease	0.0000	222	Decrease	0.0000
Puerto Rico	.	.	.	.	.	.	.
Rhode Island	.	.	.	.	.	.	.
South Carolina	1.126	0.860	Decrease	0.0000	70	Decrease	0.0000
South Dakota	.	.	.	.	.	.	.
Tennessee	1.168	0.889	Decrease	0.0000	76	Decrease	0.0000
Texas	0.936	0.639	Decrease	0.0001	15	Decrease	0.0278
Utah	.	.	.	.	.	.	.
Vermont	0.546	0.782	No	0.3690	8	No	0.3690
Virginia	0.822	0.673	Decrease	0.0078	77	Decrease	0.0069
Washington	0.632	0.485	Decrease	0.0068	64	Decrease	0.0068
West Virginia	0.709	0.483	Decrease	0.0191	38	Decrease	0.0191
Wisconsin	0.586	0.705	No	0.1844	13	No	0.4693
Wyoming	.	.	.	.	.	.	.
All U.S.	0.854	0.684	Decrease	0.0000	1644	Decrease	0.0000

Footnotes for Table 4:

1. SIRs are not reported for states with fewer than five facilities reporting CLABSI data to NHSN in 2010.
2. Data from all ICUs, wards (for this table wards also include stepdown, specialty care areas [including hematology/oncology, bone marrow transplant], and LTAC locations [or facilities]), and NICUs.
3. Continuous reporters include all facilities with at least one location that reported any data for CLABSIs during both 2009 and 2010.
4. Adjusted by limiting analysis to only continuous reporters (e.g., facility locations reporting for one month or more during 2009 that also reported during 2010).

Table 5. Changes in National Standardized Infection Ratios (SIRs), 2009 compared to 2010: Central Line-associated Bloodstream Infections (CLABSIs) and Surgical Site Infections (SSIs)[1]

	All Reporters				Continuous Reporters		
	SIR 2009	SIR 2010	Change in SIR	p-value	No. of Continuous Reporters[2]	Change in SIR[3]	p-value[3]
CLABSI, all locations	0.854	0.684	Decrease	<.001	1644	Decrease	<.001
SSI, combined procedures[1]	0.981	0.916	Decrease	0.0010	904	No change	0.1630
Hip arthroplasty	0.968	0.971	No change	0.9460	678	No change	0.5749
Knee arthroplasty	0.944	0.892	No change	0.2229	579	No change	0.9012
Coronary artery bypass graft[4]	0.962	0.820	Decrease	0.0007	306	Decrease	0.0206
Cardiac surgery	0.859	0.835	No change	0.8443	137	No change	0.8942
Peripheral vascular bypass surgery	0.714	0.935	No change	0.2033	35	No change	0.1115
Abdominal aortic aneurysm repair	0.469	0.648	No change	0.7360	23	No change	0.7305
Colon surgery	0.971	0.909	No change	0.1609	329	No change	0.6640
Rectal surgery	2.599	1.285	Decrease	0.0044	11	Decrease	0.0234
Abdominal hysterectomy	1.173	1.065	No change	0.1761	457	No change	0.2558
Vaginal hysterectomy	1.229	1.243	No change	0.9411	154	No change	0.7339

Footnotes for Tables 5:

1. SSIs included are those following NHSN surgical procedures approximating those covered by SCIP, using only SSIs that were classified as deep incisional or organ/space, and detected upon admission or readmission. Specific NHSN procedures are listed in Appendix A.
2. Continuous reporters for CLABSIs include all facilities that reported any data from at least one location during both 2009 and 2010. Continuous reporters for SSIs include all facilities that reported any data for any of the 10 SCIP procedures during both 2009 and 2010.
3. Adjusted by limiting analysis to only continuous reporters (e.g., facility locations reporting for one month or more during 2009 that also reported during 2010).
4. Coronary artery bypass graft includes procedures with either chest only or chest and donor site incisions.

Appendix A

Surgical Care Improvement Project (SCIP) Procedures, NHSN Procedures Approximating SCIP Procedures, and Validated Parameters for Surgical Site Infection Risk Models in NHSN.

SCIP Procedure	NHSN Procedure	Validated Parameters for Risk Model
Vascular	Abdominal aortic aneurysm repair	duration of procedure, wound class
	Peripheral vascular bypass surgery	age, ASA, duration of procedure, medical school affiliation
Coronary artery bypass graft	Coronary artery bypass graft with both chest and donor site incisions; Coronary artery bypass graft with chest incision only	age, ASA, duration of procedure, gender, medical school affiliation, age gender (interaction)
Other cardiac	Cardiac surgery	age, duration of procedure, emergency
Colon surgery	Colon surgery	age, ASA, duration, endoscope, medical school affiliation, hospital bed size, wound class
	Rectal surgery	duration of procedure, gender, hospital bed size
Hip arthroplasty	Hip arthroplasty	total/partial/revision, age, anesthesia, ASA, duration of procedure, medical school affiliation, hospital bed size, trauma
Abdominal hysterectomy	Abdominal hysterectomy	age, ASA, duration of procedure, hospital bed size
Knee arthroplasty	Knee arthroplasty	age, ASA, duration of procedure, gender, medical school affiliation, hospital bed size, trauma, revision
Vaginal hysterectomy	Vaginal hysterectomy	age, duration of procedure, medical school affiliation

Adapted from, Mu Y, Edwards JR, Horan TC, Berrios-Torres SI, Fridkin SK. Improving risk-adjusted measures of surgical site infection for the national healthcare safety network. Infect Control Hosp Epidemiol. 2011 Oct; 32(10):970-986.