



National Healthcare Safety Network (NHSN) Report, Data Summary for 2010, Device-associated Module

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Background

This report is a summary of Device-associated (DA) Module data collected by hospitals participating in the National Healthcare Safety Network (NHSN) for events occurring from January through December 2010 and reported to the Centers for Disease Control and Prevention (CDC) by July 7, 2011. This report updates previously published DA Module data from NHSN and provides contemporary comparative rates.¹ This report complements other NHSN reports, including national and state-specific reports of standardized infection ratios (SIRs) for select healthcare-associated infections (HAIs).^{2,3,4}

NHSN was established in 2005 to integrate and supersede three legacy surveillance systems at CDC: the National Nosocomial Infections Surveillance system, the Dialysis Surveillance Network, and the National Surveillance System for Healthcare Workers. NHSN

data collection, reporting, and analysis are organized into three components: Patient Safety, Healthcare Personnel Safety, and Biovigilance, and use standardized methods and definitions in accordance with specific module protocols.^{5,6,7} Institutions may use modules singly or simultaneously, but once selected, they must be used for a minimum of one calendar month. All infections are categorized using standard CDC definitions that include laboratory and clinical criteria.⁷ The DA Module may be used by facilities other than hospitals, including outpatient dialysis centers. A report of data from this module for outpatient dialysis centers was published separately.⁸ NHSN facilities contributing HAI surveillance data to this report did so voluntarily or in response to state mandatory reporting requirements. CDC aggregated these data into a single national database for the stated purposes in place in 2010, which were to:

- Collect data from a sample of healthcare facilities in the United States to permit valid estimation of the magnitude of adverse events among patients and healthcare personnel.
- Collect data from a sample of healthcare facilities in the United States to permit valid estimation of the adherence to practices known to be associated with prevention of these adverse events.
- Analyze and report collected data to permit recognition of trends.
- Provide facilities with risk-adjusted metrics that can be used for inter-facility comparisons and local quality improvement activities.
- Assist facilities in developing surveillance and analysis methods that permit timely recognition of patient and healthcare worker safety problems and prompt intervention with appropriate measures.
- Conduct collaborative research studies with NHSN member facilities (e.g., describe the epidemiology of emerging healthcare-associated infections [HAI] and pathogens, assess the importance of potential risk factors, further characterize HAI pathogens and their mechanisms of resistance, evaluate alternative surveillance and prevention strategies).

Patient- and facility-specific data reported to CDC are kept confidential in accordance with sections 304, 306, and 308(d) of the Public Health Service Act (42 USC 242b, 242k, and 242m(d)).



Methods

Data Collection Methods

For reporting to the DA Module, healthcare facility personnel responsible for infection prevention and patient safety may choose, with consideration of state mandates and prevention initiatives, to collect data on central line-associated primary bloodstream infections (CLABSI), ventilator-associated pneumonias (VAPs), or urinary catheter-associated urinary tract infections (CAUTI) that occur in patients staying in a patient care location such as a critical or intensive care unit (ICU), specialty care area, or inpatient ward. In NHSN, these locations are further characterized according to patient population: adults, children, or neonates (in tables, pediatric and neonatal locations are so noted). In neonatal intensive care unit (NICU) locations (level III or level II/III), infection preventionists (IPs) collect data on central line-associated and umbilical catheter-associated BSI or VAP that occur in patients in each of five birth-weight categories (≤ 750 g, 751-1000 g, 1001 - 1500 g, 1501 - 2500 g, and >2500 g); data on CAUTI are not collected in any NICU location. Corresponding location-specific denominator data consisting of patient-days and specific device-days are also collected by IPs or other trained personnel.

In non-NICU locations, the device-days consist of the total number of central line-days, urinary catheter-days, or ventilator-days. In NICU locations, the device-days consist of the total number of central line-days and umbilical catheter-days, or ventilator-days for each birth-weight category.

Data Analysis Methods

DA data reported in 2010 were compared to data published in the last report to determine if there were consistent, statistically significant differences in pooled mean rates, medians,

and percentile distributions.¹ Eight new locations – prenatal critical care, pediatric step-down (post critical care), antenatal care ward, burn ward, jail ward, pediatric surgical ward, telemetry ward, and pediatric bone marrow transplant specialty care area – had sufficient data to be included in this report.

Locations were further stratified by unit bed size and/or major teaching status to determine if pooled mean rates, medians, and empirical distributions significantly differed

between two groups for all DA infections. Comparisons of pooled mean rates were performed using Poisson regression. These comparisons could be influenced by potential outlier rates from locations with disproportionately large denominators. Therefore, greater weight was given to the results of nonparametric tests comparing the medians for location shift and empirical distributions for assessing differences across the range of reported rates. These nonparametric comparisons by definition require no validity assumptions and provide



test results that are not subject to the potential weighting influence of high or low rates with large denominators. Comparisons of the median and percentile distribution were made if there were at least 50 locations contributing to one or more strata and at least 20 locations contributing to the percentile distribution in both strata. The data for adult combined medical/surgical ICUs were split into two groups by type of hospital: “major teaching” and “all others.” Facilities self-identified teaching status through an annual facility survey. Major teaching status was defined as a hospital that is an important part of the medical school teaching program in which the majority of medical students rotate through multiple clinical services. The “all others” group of adult combined medical/surgical ICUs were further split into two groups by unit bed size: “≤15 beds” and “> 15 beds.” The data for adult medical ICUs were split into two groups by type of hospital as defined above. In addition, we assessed the potential impact of hospital type as defined above, on DA infection rates and distributions for additional critical care and inpatient ward locations, including surgical ICUs, surgical cardiothoracic ICUs, step-down units, medical wards, and medical/surgical wards.

Device utilization (DU) of a location is one measure of invasive practices in that location and constitutes an extrinsic risk factor for healthcare-associated infection.⁹ DU may also serve as a marker for severity of illness of patients, that is, patients’ intrinsic susceptibility to infection. DU is measured as a ratio of device days to patient days for each location type.

The pooled mean DA infection rates and DU ratios required data from at least 5 different reporting units of a given location type. For the percentile distributions, data from at least 20 different locations were required, excluding rates or DU ratios for locations

that did not report at least 50 device-days or patient-days. We increased the minimum number of device days or patient days to 100 days and assessed whether the distribution of the DA rates and DU ratios changed significantly. This increase did not have an impact on the percentile distributions and therefore, the minimum number of days remained at 50 days in order to maintain consistency with previous reports. Because of this, the number of locations contributing data may vary among the tables.

Results

Among the 4122 facilities eligible to report to NHSN at the end of 2010, 3029 filed monthly reporting plans signaling their intent to follow the DA module for at least one month and 2473 hospitals reported at least DA denominator data for some patient cohorts under surveillance during 2010. These 2473 hospitals were located in 49 states and the District of Columbia and were predominantly general acute care hospitals (Table



1); approximately two-thirds were smaller hospitals of 200 beds or less (63.1%), and only 12.5% were categorized as major teaching facilities (Table 2). Additionally, 71% of the hospitals included in this report are located in states with a mandate for reporting at least one type of DA infection to NHSN. Where data volume was sufficient for this report, we tabulated DA infection rates and DU ratios for January through December 2010 (Tables 3-10). Data on select attributes of the DA infections are provided in Tables 11-18.

Tables 3-6 update and augment previously published DA rates and DU ratios by type of non-NICU locations.¹ Surgical ICUs have been stratified by hospital type (i.e., major teaching and all others). Beginning in 2012, long term acute care units will no longer be considered specialty care areas of hospitals and, in an effort to reduce burden, the collection of central line days in this type of location will not be stratified by line type. In order to align with future reporting in this location type, CLABSI rates and DU ratios for this type of location have been moved to Table 3 and are no longer stratified by central line type (i.e., temporary and permanent).

Tables 7-10 update and augment the previously published, DA rates and DU ratios by birth-weight category for NICU locations.¹ Beginning in January 2012, CLABSI data in NICU locations will no longer be collected according to central line type (i.e., central line and umbilical catheter). In order to align with future reporting in these location types, CLABSI rates and DU ratios for NICUs are no longer stratified by line type.

Tables 11-18 provide data on select attributes of the DA infections for each location. For example, Tables 11, 12, 15 and 16 show the frequency and percent distribution of the specific

sites of CLABSI and the criteria used for identifying these infections. Note that for these tables, criteria 2 and 3 have been combined. There were 5 CAUTIs reported with no specific site indicated and therefore, these events have been excluded from Table 13.

Discussion

This report summarizes the HAI data reported to the DA module of NHSN during 2010. The data in this report were restricted to a single year for several reasons. First, there were more facilities contributing data than in previous years and because of this, there were sufficient data reported in 2010 to support the analysis of a single year of data (e.g., considerable data contributing to the pooled means, most location types with >20 locations reporting), thus obviating the need to combine data with previous years. Second, CAUTI data included in this report can be used to evaluate progress toward infection prevention goals established in the U. S. Department of Health and Human Services' HAI Action Plan.^{1,10} Third, analyzing one year of data removes the need to assess the influence mandatory HAI reporting and resultant increase of new reporters may have on the aggregate data across several years. Finally, by restricting data to a single year, decreases in HAI rates are more apparent and can highlight continued prevention efforts in different patient care areas. This strategy also fulfills the need for more timely publication of comparative rates.

The characteristics of hospitals reporting to NHSN remain consistent with the last published report, including a sustained contribution of smaller hospitals.¹ The diversity of health-care facilities reporting to NHSN may change in future reports as a result of two factors: 1) increased use of NHSN as the operational system to fulfill mandatory HAI reporting requirements in additional states, and 2) the



Centers for Medicare and Medicaid Services' (CMS) Hospital Inpatient Quality Reporting Program, which requires hospitals participating in this program to use NHSN as the tool to report CLABSI data from all adult, pediatric, and neonatal ICUs, which began January 1, 2011 and CAUTI data from all adult and pediatric ICUs beginning January 1, 2012.

Comparisons of these data to the previous NHSN Annual Report reveal several differences. Reporting of DA infections from inpatient wards continues to increase, which is apparent in the 85% increase in the number of both medical wards and medical/surgical wards reporting CLABSI rates.¹ The increase in the volume of DA data in this report has allowed for the inclusion of new ICU and ward locations, as well as the publication of percentile distributions for previously reported, yet low volume, location types. Of particular note is the new location, telemetry ward, in which 144 locations contributed to the CLABSI pooled mean and of those, 142 contributed to the percentile distribution.

Extensive analyses of hospital type on all DA rates were performed for 15 different types of ICU and ward locations, where data in each strata were sufficient. Hospital type continues to

be a significant factor for all three DA rates and percentile distributions in medical ICUs. Additionally, hospital type and bed size both continue to be significant factors in DA rates for medical/surgical ICUs. Note that while the CLABSI rates for medical/surgical "all other" ICUs appear to be similar, the percentile distributions were shown to be significantly different as a result of nonparametric statistical tests. Therefore, this type of stratification in medical/surgical ICUs was sustained. Through these analyses, hospital type was found to be a significant factor in surgical ICUs across all DA infections and measures. Other locations were not further stratified by hospital type, as the conclusions of the statistical tests were either not consistent across DA infections or the volume in comparative strata was too diverse. Further growth in NHSN's coverage, specifically in the number and types of inpatient wards and specialty care areas reporting data, will improve NHSN usefulness in characterizing rates of DA infections among patients in those care areas.

Another important difference in results of this report compared to those in previous reports is the combination of line types in the calculation of CLABSI rates and DU ratios for select locations. In an effort to reduce data



collection burden, the NHSN protocols will be adjusted in 2012 such that the distinction of central-line type in NICU (umbilical vs. non-umbilical) and long term-acute care (LTAC) (temporary vs. permanent) locations will no longer be required. Therefore, the CLABSI rates and DU ratios for NICU and LTAC locations were inclusive of both line types in each location.

Tables 11-18 were included to aid the reader in interpreting the DA infection rates data. One important use of these data is to better understand the distribution of DA infections by type of reporting criteria. For example, nearly 81% of the CLABSIs from adult and pediatric ICU and inpatient wards were identified using the least subjective criterion (1); however, for NICUs, approximately two-thirds used this criterion. Similarly, the specific type of ventilator-associated pneumonia (VAP) most frequently reported, regardless of location, was the clinical criterion (PNU1). However, in adult and pediatric critical care locations, approximately 42% of VAPs that were reported used more rigorous criteria that include laboratory findings (PNU2

and PNU3) whereas in NICU locations, only 17% of VAPs were reported using these same criteria.

As more and diverse types of facilities participate in NHSN either voluntarily or by mandate, the need for careful scrutiny of the data increases. We will continue to assess how the changing composition of facilities and the changing proportion of data contributed by various types of facilities impact the rates and their distributions so that the best possible risk-adjusted comparative data may be provided in future reports.

The data published in this report will be available to NHSN users for comparisons within the NHSN application early in 2012. For those that do not report to NHSN but would like to use these data for comparison, the information must first be collected from your hospital in accordance with the methods described for NHSN.^{5,6,7} Refer to Appendices A and B for further instructions. Appendix A discusses the calculation of infection rates and DU ratios for the DA Module. Appendix B gives a step-by-step method for inter-

pretation of percentiles of infection rates or DU ratios. Although a high rate or ratio (>90th percentile) does not necessarily define a problem, it does suggest an area for further investigation. Similarly, a low rate or ratio (<10th percentile) may be the result of inadequate infection detection.

Facilities should use the data in this report and their own data to guide local prevention strategies and other quality improvement efforts to reduce the occurrence of infections as much as possible.

The authors are indebted to the NHSN participants for their ongoing efforts to monitor infections and improve patient safety. We also gratefully acknowledge our colleagues in the Division of Healthcare Quality Promotion who tirelessly support this unique public health network.

The findings and conclusions of the report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Table 1. NHSN hospitals contributing data used in this report

Hospital type	N (%)
Children's	51 (2.0)
General, including acute, trauma, and teaching	2,208 (89.3)
Long Term Acute Care	86 (3.5)
Military	20 (0.8)
Oncology	11 (0.4)
Orthopedic	10 (0.4)
Psychiatric	9 (0.4)
Rehabilitation	29 (1.2)
Surgical	19 (0.8)
Veterans Affairs	19 (0.8)
Women's	5 (0.2)
Women's and Children's	6 (0.2)
Total	2473 (100)

Table 2. NHSN hospitals contributing data used in this report by hospital type and bedsize

Hospital type	Bed size category				Total
	<= 200	201-500	501-1000	> 1000	
	N (%)	N (%)	N (%)	N (%)	
Major teaching	70 (2.8)	140 (5.7)	94 (3.8)	6 (0.2)	310 (12.5)
Graduate teaching	100 (4.0)	99 (4.0)	24 (1.0)	0 (0.0)	223 (9.0)
Limited teaching	129 (5.2)	109 (4.4)	19 (0.8)	0 (0.0)	257 (10.4)
Nonteaching	1,261 (51.1)	391 (15.8)	30 (1.2)	1 (0.0)	1,683 (68.1)
Total	1,560 (63.1)	739 (29.9)	167 (6.8)	7 (0.2)	2,473 (100)

Major: Hospital is an important part of the teaching program of a medical school and the majority of medical students rotate through multiple clinical services.

Graduate: Hospital is used by the medical school for graduate training programs only; i.e., residency and/or fellowships.

Limited: Hospital is used in the medical school's teaching program only to a limited extent.

Table 3. Pooled means and key percentiles of the distribution of laboratory-confirmed central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2010

Central line-associated BSI rate*					Percentile				
Type of Location	No. of locations†	No. of CLABSIs	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical Care									
Burn	49 (47)	160	45,778	3.5	0.0	0.5	2.2	4.8	8.0
Medical -Major teaching	148 (147)	660	372,229	1.8	0.0	0.8	1.4	2.3	3.5
Medical -All other	298 (282)	507	384,630	1.3	0.0	0.0	0.7	1.8	3.4
Medical cardiac	293 (285)	503	376,962	1.3	0.0	0.0	0.9	1.8	3.1
Medical/surgical -Major teaching	192 (190)	578	417,461	1.4	0.0	0.0	1.0	2.1	3.1
Medical/surgical -All other ≤15 beds	1,170 (1036)	914	841,016	1.1	0.0	0.0	0.0	1.3	3.4
Medical/surgical -All other > 15 beds	518 (516)	1,226	1,177,318	1.0	0.0	0.0	0.8	1.5	2.5
Neurologic	24	44	37,952	1.2	0.0	0.0	0.6	2.0	3.2
Neurosurgical	95 (93)	207	154,375	1.3	0.0	0.0	0.8	1.6	2.7
Pediatric cardiothoracic	30	166	79,803	2.1	0.0	0.9	1.7	2.5	3.9
Pediatric medical	24 (19)	45	23,730	1.9					
Pediatric medical/surgical	204 (192)	477	270,003	1.8	0.0	0.0	1.4	2.6	4.9
Prenatal	6 (1)	0	335	0.0					
Respiratory	7	6	10,760	0.6					
Surgical -Major teaching	127	410	297,551	1.4	0.0	0.4	1.0	1.9	3.2
Surgical -All other	149 (147)	226	227,644	1.0	0.0	0.0	0.6	1.6	2.6
Surgical cardiothoracic	294 (293)	519	554,719	0.9	0.0	0.0	0.6	1.3	2.0
Trauma	94	378	197,290	1.9	0.0	0.6	1.5	2.7	4.0
Long-Term Acute Care‡									
Adult long-term acute care	133 (131)	689	517,837	1.3	0.0	0.3	1.1	2.1	3.2
Step-Down Units									
Adult step-down (post-critical care)	388 (378)	418	400,435	1.0	0.0	0.0	0.0	1.5	2.8
Step-down NICU (level II)	24 (11)	3	3,538	0.8					
Pediatric step-down (post-critical care)	11 (10)	9	9,371	1.0					
Inpatient Wards									
Acute stroke	15 (14)	1	8,545	0.1					
Antenatal	5 (1)	0	1,085	0.0					
Behavioral health/psychiatry	65 (14)	4	3,360	1.2					
Burn	5 (4)	5	2,028	2.5					
Genitourinary	11	11	15,947	0.7					
Geronotology	6	5	4,320	1.2					
Gynecology	36 (23)	7	10,052	0.7	0.0	0.0	0.0	0.0	2.3
Jail	10	22	7,899	2.8					
Labor and delivery	32 (3)	0	1,810	0.0					
Labor, delivery, recovery, postpartum suite	65 (6)	1	1,711	0.6					
Medical	537 (510)	665	615,168	1.1	0.0	0.0	0.3	1.5	2.9
Medical/surgical	1,500 (1386)	1,209	1,304,991	0.9	0.0	0.0	0.0	1.3	2.6
Neurologic	39 (38)	25	32,628	0.8	0.0	0.0	0.0	1.4	2.3
Neurosurgical	39 (37)	25	31,344	0.8	0.0	0.0	0.0	0.9	2.6
Orthopedic	171 (149)	52	92,107	0.6	0.0	0.0	0.0	0.0	1.8
Orthopedic trauma	10	21	13,028	1.6					
Pediatric medical	29 (21)	40	33,086	1.2	0.0	0.0	0.7	2.4	4.9
Pediatric medical/surgical	187 (119)	156	105,530	1.5	0.0	0.0	0.0	1.5	3.1
Pediatric orthopedic	6 (1)	2	1,242	1.6					
Pediatric rehabilitation	12	12	4,283	2.8					

Pediatric surgical	8	18	13,765	1.3					
Postpartum	96 (11)	0	3,128	0.0					
Pulmonary	19	36	34,422	1.0					
Rehabilitation	242 (220)	53	98,631	0.5	0.0	0.0	0.0	0.0	1.7
Surgical	295 (281)	305	303,472	1.0	0.0	0.0	0.0	1.5	2.4
Telemetry	144 (142)	110	109,619	1.0	0.0	0.0	0.0	1.6	3.5
Vascular Surgery	20	16	21,217	0.8	0.0	0.0	0.0	0.8	1.2
Well-Baby Nursery	13 (0)	0	133	0.0					
Inpatient Long Term Care									
Chronic care¥	12 (10)	4	8,122	0.5					

Central line utilization ratio**					Percentile				
Type of Location	No. of locations†	No. of CLABSIs	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical Care									
Burn	49	45,778	102,752	0.45	0.25	0.32	0.41	0.58	0.79
Medical									
-Major teaching	148	372,229	607,548	0.61	0.44	0.50	0.61	0.69	0.76
-All other	298 (295)	384,630	868,365	0.44	0.14	0.28	0.43	0.57	0.68
Medical cardiac	293 (292)	376,962	930,724	0.41	0.17	0.28	0.41	0.53	0.65
Medical/surgical									
-Major teaching	192	417,461	722,832	0.58	0.33	0.45	0.56	0.67	0.76
-All other ≤15 beds	1,170 (1152)	841,016	2,189,208	0.38	0.11	0.20	0.34	0.50	0.64
-All other > 15 beds	518	1,177,318	2,474,278	0.48	0.29	0.40	0.52	0.63	0.72
Neurologic	24	37,952	70,874	0.54	0.20	0.30	0.43	0.63	0.72
Neurosurgical	95	154,375	355,199	0.43	0.22	0.34	0.45	0.53	0.62
Pediatric cardiothoracic	30	79,803	115,389	0.69	0.48	0.58	0.78	0.88	0.92
Pediatric medical	24	23,730	52,654	0.45	0.09	0.16	0.27	0.45	0.62
Pediatric medical/surgical	204 (201)	270,003	560,703	0.48	0.15	0.27	0.40	0.56	0.64
Prenatal	6	335	6,738	0.05					
Respiratory	7	10,760	18,810	0.57					
Surgical									
-Major teaching	127	297,551	484,457	0.61	0.44	0.51	0.60	0.71	0.78
-All other	149 (148)	227,644	408,336	0.56	0.36	0.45	0.57	0.67	0.75
Surgical cardiothoracic	294	554,719	818,880	0.68	0.41	0.53	0.69	0.82	0.91
Trauma	94	197,290	350,356	0.56	0.37	0.50	0.57	0.65	0.77
Long Term Acute Care‡									
Adult Long Term Acute Care	133	517,837	887,259	0.58	0.23	0.50	0.65	0.81	0.90
Step-Down Units									
Adult step-down (post-critical care)	388 (386)	400,435	2,005,163	0.20	0.08	0.12	0.19	0.30	0.40
Step-down NICU (level II)	24 (23)	3,538	38,994	0.09	0.02	0.03	0.06	0.13	0.15
Pediatric step-down (post-critical care)	11	9,371	34,515	0.27					
Inpatient Wards									
Acute stroke	15	8,545	62,890	0.14					
Antenatal	5	1,085	8,375	0.13					
Behavioral health/psychiatry	65	3,360	123,866	0.03	0.00	0.01	0.02	0.03	0.05
Burn	5	2,028	9,105	0.22					
Genitourinary	11	15,947	67,947	0.23					
Geronotology	6	4,320	38,168	0.11					
Gynecology	36 (35)	10,052	107,382	0.09	0.01	0.02	0.04	0.07	0.21
Jail	10	7,899	34,005	0.23					
Labor and delivery	32	1,810	33,918	0.05	0.00	0.01	0.01	0.02	0.10
Labor, delivery, recovery, postpartum suite	65 (64)	1,711	58,883	0.03	0.00	0.01	0.01	0.03	0.06
Medical	537 (535)	615,168	3,308,037	0.19	0.06	0.10	0.15	0.23	0.32

Central line utilization ratio**					Percentile				
Type of Location	No. of locations†	No. of CLABSIs	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Medical/surgical	1,500 (1492)	1,304,991	8,702,804	0.15	0.05	0.08	0.12	0.18	0.27
Neurologic	39	32,628	206,933	0.16	0.07	0.11	0.15	0.19	0.32
Neurosurgical	39	31,344	195,245	0.16	0.06	0.08	0.16	0.21	0.29
Orthopedic	171 (167)	92,107	885,996	0.10	0.03	0.05	0.09	0.13	0.17
Orthopedic Trauma	10	13,028	80,016	0.16					
Pediatric medical	29 (28)	33,086	130,110	0.25	0.02	0.09	0.18	0.25	0.35
Pediatric medical/surgical	187 (183)	105,530	557,834	0.19	0.02	0.04	0.09	0.22	0.34
Pediatric orthopedic	6 (4)	1,242	9,088	0.14					
Pediatric rehabilitation	12	4,283	31,978	0.13					
Pediatric surgical	8	13,765	45,583	0.30					
Postpartum	96	3,128	161,628	0.02	0.00	0.00	0.01	0.02	0.03
Pulmonary	19	34,422	139,868	0.25					
Rehabilitation	242 (241)	98,631	1,168,934	0.08	0.03	0.05	0.08	0.11	0.14
Surgical	295 (294)	303,472	1,811,541	0.17	0.06	0.09	0.15	0.22	0.28
Telemetry	144 (143)	109,619	731,211	0.15	0.07	0.09	0.14	0.20	0.27
Vascular surgery	20	21,217	89,692	0.24	0.10	0.11	0.19	0.32	0.47
Well-Baby Nursery	13 (10)	133	8,574	0.02					
Inpatient Long Term Care									
Chronic care unit‡	12 (11)	8,122	39,571	0.21					

CLABSI, central line-associated bloodstream infection; NICU, neonatal intensive care unit.

* $\frac{\text{Number of CLABSI}}{\text{Number of central line-days}} \times 1000$

** $\frac{\text{Number of central line-days}}{\text{Number of patient-days}}$

BSI, bloodstream infection; CLABSI, central line-associated BSI.

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20 , percentile distributions are not calculated.

‡ Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

¥ Includes inpatient long term care locations within the general acute care hospital setting.

Table 4. Pooled means and key percentiles of the distribution of laboratory-confirmed permanent and temporary central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2010

Permanent Central line-associated BSI rate*					Percentile				
Type of Location	No. of locations+	No. of PCLABSIs	Permanent Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Specialty Care Area									
Bone marrow transplant	40	233	93,109	2.5	0.0	0.5	1.9	4.5	6.5
Hematology/oncology	99 (97)	200	157,792	1.3	0.0	0.0	0.7	1.6	3.2
Pediatric bone marrow transplant	8	41	12,927	3.2					
Pediatric hematology/oncology	31	124	74,962	1.7	0.0	0.0	1.5	2.2	3.0
Solid organ transplant	8 (6)	2	7,201	0.3					

Temporary Central line-associated BSI rate**					Percentile				
Type of Location	No. of locations+	No. of TCLABSIs	Temporary Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Specialty Care Area									
Bone marrow transplant	37 (36)	189	62,315	3.0	0.0	0.0	2.4	4.0	5.8
Hematology/oncology	114 (113)	282	142,302	2.0	0.0	0.0	0.9	2.7	4.7
Pediatric bone marrow transplant	7 (5)	8	3,747	2.1					
Pediatric hematology/oncology	30 (27)	64	23,236	2.8	0.0	0.0	1.2	3.9	15.1
Solid organ transplant	14	31	26,809	1.2					

Permanent Central line utilization ratio #					Percentile				
Type of location	No. of locations+	Permanent Central line-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Specialty Care Area									
Bone marrow transplant	40	93,109	171,138	0.54	0.16	0.26	0.48	0.72	0.81
Hematology/oncology	99	157,792	486,056	0.32	0.12	0.19	0.30	0.46	0.66
Pediatric bone marrow transplant	8	12,927	17,301	0.75					
Pediatric hematology/oncology	31	74,962	114,646	0.65	0.34	0.55	0.69	0.79	0.88
Solid organ transplant	8 (7)	7,201	44,363	0.16					

Temporary Central line utilization ratio ##				Percentile					
Type of location	No. of locations+	Temporary Central line-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Specialty Care Area									
Bone marrow transplant	37	62,315	140,073	0.44	0.10	0.29	0.51	0.66	0.83
Hematology/oncology	114	142,302	547,891	0.26	0.10	0.16	0.23	0.39	0.55
Pediatric bone marrow transplant	7	3,747	10,257	0.37					
Pediatric hematology/oncology	30	23,236	106,174	0.22	0.03	0.06	0.11	0.20	0.44
Solid organ transplant	14	26,809	67,852	0.40					

BSI, bloodstream infection; PCLABSI, permanent central line-associated BSI; TCLABSI, temporary central line-associated BSI

* $\frac{\text{Number of PCLABSI}}{\text{Number of permanent central line-days}} \times 1000$

** $\frac{\text{Number of TCLABSI}}{\text{Number of temporary central line-days}} \times 1000$

$\frac{\text{Number of permanent central line-days}}{\text{Number of patient-days}}$

$\frac{\text{Number of temporary central line-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number is < 20 , percentile distributions are not calculated.

Table 5. Pooled means and key percentiles of the distribution of urinary catheter-associated UTI rates and urinary catheter utilization ratios, by type of location, DA module, 2010

Urinary catheter-associated UTI rate*					Percentile				
Type of location	No. of locations +	No. of CAUTIs	Urinary catheter-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	23	115	24,324	4.7	0.0	2.2	4.7	7.2	9.6
Medical -Major teaching	67	470	192,002	2.4	0.3	0.9	1.8	3.7	5.5
Medical -All other	110 (107)	436	232,454	1.9	0.0	0.0	1.2	2.5	4.0
Medical cardiac	139	414	213,535	1.9	0.0	0.3	1.6	3.1	4.3
Medical/Surgical -Major teaching	98	587	263,186	2.2	0.0	0.6	1.8	3.4	4.6
Medical/Surgical -All other, ≤15 beds	397 (376)	555	434,729	1.3	0.0	0.0	0.0	1.7	3.2
Medical/Surgical -All other, >15 beds	201 (200)	770	596,233	1.3	0.0	0.4	1.0	1.9	2.8
Neurologic	12	84	27,681	3.0					
Neurosurgical	45	446	110,797	4.0	0.0	1.3	3.4	5.5	6.9
Pediatric cardiothoracic	10 (8)	21	8,988	2.3					
Pediatric medical	6	6	1,527	3.9					
Pediatric medical/surgical	78 (72)	127	57,420	2.2	0.0	0.0	0.9	3.3	5.4
Surgical -Major teaching	59	471	157,384	3.0	0.2	1.0	1.9	4.4	6.0
Surgical -All other	53	182	118,919	1.5	0.0	0.0	1.0	2.2	3.7
Surgical cardiothoracic	124	371	239,246	1.6	0.0	0.0	1.0	2.4	3.4
Trauma	51	488	151,217	3.2	0.4	1.4	3.2	5.5	7.7
Specialty Care Areas									
Bone marrow transplant	14 (13)	9	5,541	1.6					
Hematology/oncology	59 (57)	97	48,177	2.0	0.0	0.0	1.6	3.4	5.4
Pediatric hematology/oncology	6 (3)	0	477	0.0					
Long-Term Acute Care‡									
Long-term acute care	72 (69)	552	211,027	2.6	0.0	0.8	2.4	4.6	5.7
Step-down Units									
Adult step-down (post-critical care)	204 (198)	493	276,397	1.8	0.0	0.0	1.1	2.7	4.7
Pediatric step-down (post critical care)	5 (4)	2	454	4.4					
Inpatient Wards									
Acute stroke	8	2	8,896	0.2					
Behavioral health/psychiatry	79 (32)	13	6,687	1.9	0.0	0.0	0.0	0.0	6.6
Genitourinary	7	10	10,684	0.9					
Gerontology	5 (3)	4	3,216	1.2					
Gynecology	22 (20)	10	17,307	0.6	0.0	0.0	0.0	0.0	0.5
Labor and delivery	34 (24)	6	11,051	0.5	0.0	0.0	0.0	0.0	6.0
Labor, delivery, recovery, postpartum suite	78 (68)	16	22,853	0.7	0.0	0.0	0.0	0.0	3.8
Medical	341 (331)	539	333,155	1.6	0.0	0.0	1.0	2.5	4.7
Medical/Surgical	877 (842)	1,254	854,649	1.5	0.0	0.0	0.8	2.3	3.9
Neurologic	23	49	25,030	2.0	0.0	0.0	1.3	2.5	3.8
Neurosurgical	22	76	34,773	2.2	0.0	0.0	1.3	2.6	3.6
Orthopedic	102 (95)	163	127,082	1.3	0.0	0.0	0.7	1.9	3.3
Orthopedic trauma	5	6	8,138	0.7					
Pediatric medical/surgical	84 (42)	18	13,283	1.4	0.0	0.0	0.0	0.0	3.0
Pediatric medical	14 (6)	2	1,379	1.5					
Postpartum	94 (88)	20	49,862	0.4	0.0	0.0	0.0	0.0	2.6
Pulmonary	11	19	14,676	1.3					
Rehabilitation	181 (166)	249	78,514	3.2	0.0	0.0	1.1	4.3	8.9
Pediatric rehabilitation	7 (4)	2	723	2.8					

Surgical	170 (168)	362	233,119	1.6	0.0	0.0	1.2	2.4	4.0
Telemetry	32	11	20,841	0.5	0.0	0.0	0.0	0.0	2.3
Vascular surgery	8	21	8,324	2.5					
Well-baby nursery	5 (1)	0	226	0.0					
Inpatient Long Term Care									
Chronic care¥	8	9	4,038	2.2					

Type of location	Urinary catheter utilization ratio**				Percentile				
	No. of locations +	Urinary catheter-days	Patient days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical Care Units									
Burn	23	24,324	47,388	0.51	0.34	0.42	0.47	0.62	0.75
Medical -Major teaching	67	192,002	261,834	0.73	0.57	0.66	0.75	0.80	0.85
Medical -All other	110	232,454	355,856	0.65	0.38	0.55	0.68	0.78	0.83
Medical cardiac	139	213,535	431,323	0.50	0.27	0.38	0.53	0.66	0.75
Medical/Surgical -Major teaching	98	263,186	361,301	0.73	0.52	0.66	0.75	0.81	0.85
Medical/Surgical -All other, ≤15 beds	397 (390)	434,729	695,150	0.63	0.36	0.48	0.63	0.76	0.84
Medical/Surgical -All other, >15 beds	201 (200)	596,233	843,654	0.71	0.54	0.65	0.74	0.80	0.86
Neurologic	12	27,681	33,829	0.82					
Neurosurgical	45	110,797	150,613	0.74	0.58	0.69	0.78	0.82	0.86
Pediatric cardiothoracic	10	8,988	45,106	0.20					
Pediatric medical	6	1,527	9,843	0.16					
Pediatric medical/surgical	78 (77)	57,420	223,652	0.26	0.08	0.14	0.23	0.30	0.36
Surgical -Major teaching	59	157,384	205,973	0.76	0.61	0.72	0.79	0.84	0.89
Surgical -All other	53	118,919	152,651	0.78	0.61	0.68	0.78	0.85	0.92
Surgical cardiothoracic	124	239,246	345,376	0.69	0.40	0.62	0.73	0.83	0.89
Trauma	51	151,217	188,295	0.80	0.64	0.76	0.81	0.88	0.92
Specialty Care Areas									
Bone marrow transplant	14	5,541	58,094	0.10					
Hematology/oncology	59	48,177	281,804	0.17	0.08	0.10	0.16	0.23	0.31
Pediatric hematology/oncology	6	477	27,608	0.02					
Long-Term Acute Care‡									
Long-term acute care	72	211,027	420,366	0.50	0.24	0.43	0.52	0.66	0.72
Step-down Units									
Adult step-down (post-critical care)	204 (203)	276,397	1,065,611	0.26	0.13	0.17	0.25	0.40	0.55
Pediatric step-down (post critical care)	5	454	20,039	0.02					
Inpatient Wards									
Acute stroke	8	8,896	30,280	0.29					
Behavioral health/psychiatry	79	6,687	208,810	0.03	0.00	0.01	0.02	0.04	0.05
Genitourinary	7	10,684	53,329	0.20					
Gerontology	5	3,216	21,027	0.15					
Gynecology	22	17,307	74,747	0.23	0.07	0.10	0.19	0.35	0.42
Labor and delivery	34	11,051	53,779	0.21	0.01	0.05	0.11	0.20	0.37
Labor, delivery, recovery, postpartum suite	78 (77)	22,853	152,307	0.15	0.06	0.10	0.13	0.19	0.34
Medical	341 (340)	333,155	1,817,691	0.18	0.09	0.13	0.17	0.23	0.33
Medical/Surgical	877 (872)	854,649	4,467,055	0.19	0.10	0.13	0.18	0.24	0.32
Neurologic	23	25,030	113,382	0.22	0.08	0.13	0.18	0.26	0.35
Neurosurgical	22	34,773	108,662	0.32	0.16	0.18	0.30	0.41	0.55
Orthopedic	102 (101)	127,082	463,822	0.27	0.12	0.18	0.28	0.36	0.42
Orthopedic trauma	5	8,138	41,482	0.20					

Pediatric medical/surgical	84 (81)	13,283	182,269	0.07	0.01	0.02	0.04	0.10	0.16
Pediatric medical	14	1,379	54,765	0.03					
Postpartum	94	49,862	317,145	0.16	0.05	0.09	0.14	0.20	0.23
Pulmonary	11	14,676	65,931	0.22					
Rehabilitation	181	78,514	924,469	0.08	0.03	0.05	0.07	0.11	0.15
Pediatric rehabilitation	7	723	11,856	0.06					
Surgical	170 (169)	233,119	955,074	0.24	0.14	0.18	0.23	0.31	0.38
Telemetry	32	20,841	101,438	0.21	0.11	0.15	0.20	0.25	0.29
Vascular surgery	8	8,324	38,650	0.22					
Well-baby nursery	5 (3)	226	1,205	0.19					
Inpatient Long Term Care									
Chronic care¥	8	4,038	22,722	0.18					

CAUTI, catheter-associated urinary tract infection.

* $\frac{\text{Number of CAUTI}}{\text{Number of urinary catheter-days}} \times 1000$

** $\frac{\text{Number of urinary catheter-days}}{\text{Number of patient-days}}$

UTI, urinary tract infection; CAUTI, urinary catheter-associated UTI.

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20 , percentile distributions are not calculated.

‡ Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

¥ Includes inpatient long term care locations within the general acute care hospital setting.

Table 6. Pooled means and key percentiles of the distribution of ventilator-associated PNEU rates and ventilator utilization ratios, by type of location, DA module, 2010

Ventilator-associated PNEU rate*					Percentile				
Type of location	No. of locations +	No. of VAP	Ventilator -days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical Care Units									
Burn	24	89	15,379	5.8	0.0	2.1	3.3	7.9	13.3
Medical -Major teaching	78	208	153,408	1.4	0.0	0.1	1.0	2.2	3.7
Medical -All other	116 (106)	132	132,014	1.0	0.0	0.0	0.0	1.4	3.4
Medical cardiac	131 (125)	131	103,375	1.3	0.0	0.0	0.0	2.1	3.8
Medical/surgical -Major teaching	101	307	167,857	1.8	0.0	0.0	1.1	2.5	4.2
Medical/surgical -All other ≤15 beds	435 (359)	256	221,857	1.2	0.0	0.0	0.0	1.1	4.0
Medical/surgical -All other >15 beds	211 (209)	387	358,913	1.1	0.0	0.0	0.3	1.6	2.9
Neurologic	15	71	14,837	4.8					
Neurosurgical	47 (46)	165	53,966	3.1	0.0	0.5	2.3	4.7	6.6
Pediatric cardiothoracic	13	20	26,784	0.7					
Pediatric medical	10	10	8,737	1.1					
Pediatric medical/surgical	90 (82)	120	103,094	1.2	0.0	0.0	0.0	1.7	3.3
Respiratory	6	0	6,659	0.0					
Surgical -Major teaching	70	374	106,736	3.5	0.0	0.4	1.7	4.8	10.8
Surgical -All other	61	181	71,746	2.5	0.0	0.0	1.2	3.9	6.1
Surgical cardiothoracic	126 (123)	218	132,307	1.6	0.0	0.0	0.4	2.9	4.6
Trauma	48	555	92,460	6.0	0.0	1.7	5.3	8.8	12.3
Long Term Acute Care‡									
Adult long-term acute care	61	66	103,509	0.6	0.0	0.0	0.0	0.8	1.3
Step-Down Units									
Adult step-down (post-critical care)	51 (43)	28	25,933	1.1	0.0	0.0	0.0	0.9	4.8
Inpatient Wards									
Medical	21 (12)	1	5,931	0.2					
Medical/surgical	36 (26)	6	15,281	0.4	0.0	0.0	0.0	0.0	1.0
Neurosurgical	5 (4)	2	2,007	1.0					
Pediatric medical	6 (5)	0	2,473	0.0					
Pediatric medical/surgical	8 (4)	1	1,435	0.7					
Pulmonary	6	7	3,874	1.8					

Ventilator utilization ratio**					Percentile				
Type of location	No. of locations +	Ventilator -days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical Care Units									
Burn	24	15,379	51,916	0.30	0.11	0.20	0.25	0.35	0.56
Medical -Major teaching	78	153,408	324,537	0.47	0.28	0.35	0.47	0.56	0.66
Medical -All other	116	132,014	381,370	0.35	0.08	0.17	0.35	0.44	0.53
Medical cardiac	131	103,375	392,963	0.26	0.10	0.16	0.25	0.33	0.42
Medical/surgical -Major teaching	101	167,857	380,862	0.44	0.20	0.28	0.40	0.54	0.63
Medical/surgical -All other ≤15 beds	435 (427)	221,857	829,905	0.27	0.06	0.11	0.22	0.35	0.46
Medical/surgical -All other >15 beds	211	358,913	1,121,269	0.32	0.19	0.26	0.35	0.44	0.52
Neurologic	15	14,837	39,863	0.37					
Neurosurgical	47	53,966	178,117	0.30	0.20	0.25	0.32	0.39	0.46
Pediatric cardiothoracic	13	26,784	57,046	0.47					
Pediatric medical	10	8,737	24,939	0.35					
Pediatric medical/surgical	90	103,094	257,538	0.40	0.13	0.20	0.32	0.44	0.51
Respiratory	6	6,659	14,029	0.47					
Surgical -Major teaching	70	106,736	256,765	0.42	0.24	0.32	0.39	0.47	0.57
Surgical -All other	61	71,746	204,796	0.35	0.22	0.28	0.35	0.44	0.54
Surgical cardiothoracic	126	132,307	372,207	0.36	0.16	0.22	0.33	0.46	0.53
Trauma	48	92,460	185,779	0.50	0.34	0.41	0.49	0.57	0.69
Long Term Acute Care‡									
Adult long-term acute care	61	103,509	370,010	0.28	0.09	0.16	0.25	0.44	0.54
Step-Down Units									
Adult step-down (post-critical care)	51	25,933	213,676	0.12	0.02	0.03	0.07	0.15	0.29
Inpatient Wards									
Medical	21	5,931	105,652	0.06	0.00	0.01	0.03	0.05	0.06
Medical/surgical	36	15,281	179,496	0.09	0.00	0.02	0.04	0.15	0.23
Neurosurgical	5	2,007	22,054	0.09					
Pediatric medical	6	2,473	30,987	0.08					
Pediatric medical/surgical	8	1,435	32,854	0.04					
Pulmonary	6	3,874	34,830	0.11					

VAP, ventilator-associated pneumonia.

* $\frac{\text{Number of VAP}}{\text{Number of ventilator-days}} \times 1000$

** $\frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20, percentile distributions are not calculated.

‡ Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

Table 7. Pooled means and key percentiles of the distribution of central line-associated BSI rates and central line utilization ratios for level III NICUs, DA module, 2010

Central line-associated BSI rate*					Percentile				
Birth-weight category	No. of locations ⁺	No. of CLABSI	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	226 (200)	320	121,245	2.6	0.0	0.0	1.7	4.9	8.1
751-1000 grams	230 (207)	244	110,563	2.2	0.0	0.0	1.2	3.5	6.3
1001-1500 grams	240 (213)	141	110,447	1.3	0.0	0.0	0.0	1.9	4.8
1501-2500 grams	243 (195)	97	97,228	1.0	0.0	0.0	0.0	1.3	3.4
> 2500 grams	245 (184)	89	107,348	0.8	0.0	0.0	0.0	0.5	2.0

Central line utilization ratio**					Percentile				
Birth-weight category	No. of locations ⁺	Central line-days	Patient-days	Pooled Mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	226 (209)	121,245	290,014	0.42	0.26	0.36	0.45	0.56	0.68
751-1000 grams	230 (218)	110,563	291,301	0.38	0.23	0.30	0.39	0.48	0.61
1001-1500 grams	240 (234)	110,447	383,798	0.29	0.12	0.19	0.27	0.38	0.56
1501-2500 grams	243 (238)	97,228	508,882	0.19	0.05	0.09	0.15	0.25	0.43
> 2500 grams	245 (237)	107,348	418,118	0.26	0.05	0.09	0.17	0.31	0.44

CLABSI, central line-associated bloodstream infection; NICU, neonatal intensive care unit.

* $\frac{\text{Number of CLABSI}}{\text{Number of central line-days}} \times 1000$

** $\frac{\text{Number of central line-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20, percentile distributions are not calculated.

Table 8. Pooled means and key percentiles of the distribution of central line-associated BSI rates and central line utilization ratios for level II/III NICUs, DA module, 2010

Central line-associated BSI rate*					Percentile				
Birth-weight category	No. of locations ⁺	No. of CLABSI	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	191 (138)	161	55,136	2.9	0.0	0.0	0.0	4.9	7.6
751-1000 grams	214 (156)	114	50,367	2.3	0.0	0.0	0.0	3.7	7.7
1001-1500 grams	248 (184)	88	63,360	1.4	0.0	0.0	0.0	1.7	5.9
1501-2500 grams	257 (166)	54	56,298	1.0	0.0	0.0	0.0	0.0	2.5
> 2500 grams	263 (143)	38	52,052	0.7	0.0	0.0	0.0	0.0	3.4

Central line utilization ratio**					Percentile				
Birth-weight category	No. of locations ⁺	Central line-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	191 (150)	55,136	116,087	0.47	0.32	0.41	0.52	0.65	0.78
751-1000 grams	214 (180)	50,367	124,413	0.40	0.23	0.33	0.43	0.54	0.67
1001-1500 grams	248 (216)	63,360	205,310	0.31	0.12	0.20	0.29	0.40	0.55
1501-2500 grams	257 (246)	56,298	315,128	0.18	0.05	0.08	0.13	0.22	0.34
> 2500 grams	263 (244)	52,052	251,662	0.21	0.05	0.08	0.13	0.23	0.37

CLABSI, central line-associated bloodstream infection; NICU, neonatal intensive care unit.

* $\frac{\text{Number of CLABSI}}{\text{Number of central line-days}} \times 1000$

** $\frac{\text{Number of central line-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20, percentile distributions are not calculated.

Table 9. Pooled means and key percentiles of the distribution of ventilator-associated PNEU rates and ventilator utilization ratios for level III NICUs, DA module, 2010

Ventilator-associated PNEU rate*					Percentile				
Birth-weight category	No. of locations +	No. of VAP	Ventilator-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	97 (89)	67	49,707	1.3	0.0	0.0	0.0	1.9	3.9
751-1000 grams	97 (82)	26	29,111	0.9	0.0	0.0	0.0	0.0	2.5
1001-1500 grams	97 (61)	14	16,067	0.9	0.0	0.0	0.0	0.0	4.2
1501-2500 grams	98 (54)	7	16,585	0.4	0.0	0.0	0.0	0.0	0.0
> 2500 grams	102 (55)	11	24,886	0.4	0.0	0.0	0.0	0.0	0.7

Ventilator utilization ratio **					Percentile				
Birth-weight category	No. of locations +	Ventilator-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	97 (95)	49,707	127,762	0.39	0.23	0.29	0.41	0.55	0.67
751-1000 grams	97 (93)	29,111	119,746	0.24	0.10	0.13	0.21	0.34	0.46
1001-1500 grams	97 (93)	16,067	146,970	0.11	0.03	0.05	0.09	0.15	0.32
1501-2500 grams	98 (94)	16,585	197,318	0.08	0.02	0.02	0.05	0.12	0.18
> 2500 grams	102 (99)	24,886	175,914	0.14	0.03	0.04	0.08	0.15	0.26

VAP, ventilator-associated pneumonia; NICU, neonatal intensive care unit.

* $\frac{\text{Number of VAP}}{\text{Number of ventilator-days}} \times 1000$

** $\frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20, percentile distributions are not calculated.

Table 10. Pooled means and key percentiles of the distribution of ventilator-associated PNEU rates and ventilator utilization ratios for level II/III NICUs, DA module, 2010

Ventilator-associated PNEU rate *					Percentile				
Birth-weight category	No. of locations +	No. of VAP	Ventilator-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	65 (48)	36	17,442	2.1	0.0	0.0	0.0	3.7	9.5
751-1000 grams	73 (46)	18	10,040	1.8	0.0	0.0	0.0	0.0	4.4
1001-1500 grams	75 (35)	7	5,942	1.2	0.0	0.0	0.0	0.0	6.3
1501-2500 grams	75 (24)	3	5,264	0.6	0.0	0.0	0.0	0.0	0.0
> 2500 grams	82 (29)	2	6,699	0.3	0.0	0.0	0.0	0.0	0.0

Ventilator utilization ratio **					Percentile				
Birth-weight category	No. of locations +	Ventilator-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤ 750 grams	65 (57)	17,442	43,013	0.41	0.21	0.31	0.36	0.52	0.69
751-1000 grams	73 (63)	10,040	44,086	0.23	0.09	0.13	0.21	0.33	0.40
1001-1500 grams	75 (71)	5,942	61,886	0.10	0.03	0.05	0.07	0.11	0.23
1501-2500 grams	75 (71)	5,264	87,855	0.06	0.01	0.02	0.03	0.05	0.10
> 2500 grams	82 (80)	6,699	75,089	0.09	0.03	0.03	0.05	0.09	0.15

* $\frac{\text{Number of VAP}}{\text{Number of ventilator-days}} \times 1000$

** $\frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$

+ The number in parentheses is the number of locations meeting minimum requirements for percentile distributions (i.e., ≥ 50 device days for rate distributions, ≥ 50 patient days for device utilization ratios) if less than total number of locations. If this number < 20, percentile distributions are not calculated.

Table 11. Distribution of criteria for central line-associated laboratory-confirmed BSI by location, 2010

Type of Location	LCBI				Total
	Criterion	n(%)	Criterion 2/3	n(%)	
Critical Care					
Burn	152	95.0%	8	5.0%	160
Medical -Major teaching	564	85.5%	96	14.5%	660
Medical -All other	419	82.6%	88	17.4%	507
Medical cardiac	406	80.7%	97	19.3%	503
Medical/surgical -Major teaching	475	82.2%	103	17.8%	578
Medical/surgical -All other ≤15 beds	714	78.1%	200	21.9%	914
Medical/surgical -All other > 15 beds	935	76.3%	291	23.7%	1,226
Neurologic	38	86.4%	6	13.6%	44
Neurosurgical	157	75.8%	50	24.2%	207
Pediatric cardiothoracic	139	83.7%	27	16.3%	166
Pediatric medical	35	77.8%	10	22.2%	45
Pediatric medical/surgical	386	80.9%	91	19.1%	477
Respiratory	6	100.0%			6
Surgical -Major teaching	330	80.5%	80	19.5%	410
Surgical -All other	186	82.3%	40	17.7%	226
Surgical cardiothoracic	418	80.5%	101	19.5%	519
Trauma	316	83.6%	62	16.4%	378
Long-Term Acute Care*					
Adult long-term acute care	583	84.6%	106	15.4%	689
Step-Down Units					
Adult step-down (post-critical care)	337	80.6%	81	19.4%	418
Step-down NICU (level II)	2	66.7%	1	33.3%	3
Pediatric step-down (post-critical care)	9	100.0%			9
Inpatient Wards					
Acute stroke	1	100.0%			1
Behavioral health/psychiatry	4	100.0%			4
Burn	5	100.0%			5
Genitourinary	10	90.9%	1	9.1%	11
Geronotology	4	80.0%	1	20.0%	5
Gynecology	5	71.4%	2	28.6%	7
Jail	17	77.3%	5	22.7%	22
Labor, delivery, recovery, postpartum suite	1	100.0%			1
Medical	547	82.3%	118	17.7%	665
Medical/surgical	960	79.4%	249	20.6%	1,209
Neurologic	22	88.0%	3	12.0%	25
Neurosurgical	21	84.0%	4	16.0%	25
Orthopedic	44	84.6%	8	15.4%	52
Orthopedic trauma	18	85.7%	3	14.3%	21
Pediatric medical	30	75.0%	10	25.0%	40
Pediatric medical/surgical	121	77.6%	35	22.4%	156
Pediatric orthopedic	2	100.0%			2
Pediatric rehabilitation	11	91.7%	1	8.3%	12
Pediatric surgical	17	94.4%	1	5.6%	18
Pulmonary	29	80.6%	7	19.4%	36
Rehabilitation	46	86.8%	7	13.2%	53

Type of Location	LCBI				Total
	Criterion	n(%)	Criterion 2/3	n(%)	
Surgical	234	76.7%	71	23.3%	305
Telemetry	89	80.9%	21	19.1%	110
Vascular surgery	15	93.8%	1	6.3%	16
Chronic care‡	2	50.0%	2	50.0%	4
Total	8,862	80.9%	2,088	19.1%	10,950

BSI, bloodstream infection; LCBI, laboratory-confirmed BSI.⁷

* Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

‡ Includes inpatient long term care locations within the general acute care hospital setting.

Table 12. Distribution of criteria for permanent and temporary central line-associated laboratory-confirmed BSI by location, 2010

Type of location	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
Permanent Central Line					
Bone marrow transplant	185	79.4%	48	20.6%	233
Hematology/oncology	142	71.0%	58	29.0%	200
Pediatric bone marrow transplant	32	78.0%	9	22.0%	41
Pediatric hematology/oncology	98	79.0%	26	21.0%	124
Solid organ transplant	2	100.0%			2
Total	459	76.5%	141	23.5%	600
Temporary Central Line					
Bone marrow transplant	145	76.7%	44	23.3%	189
Hematology/oncology	232	82.3%	50	17.7%	282
Pediatric bone marrow transplant	7	87.5%	1	12.5%	8
Pediatric hematology/oncology	52	81.3%	12	18.8%	64
Solid organ transplant	21	67.7%	10	32.3%	31
Total	457	79.6%	117	20.4%	574

BSI, bloodstream infection; LCBI, laboratory-confirmed BSI.⁷

Table 13. Distribution of specific sites of urinary catheter-associated UTI by location, 2010

Type of location	SUTI	n (%)	ABUTI	n (%)	Total
Critical care units					
Burn	113	98.3%	2	1.7%	115
Medical -Major teaching	462	98.5%	7	1.5%	469
Medical -All other	420	96.8%	14	3.2%	434
Medical cardiac	408	98.6%	6	1.4%	414
Medical/Surgical -Major teaching	576	98.1%	11	1.9%	587
Medical/Surgical -All other, ≤15 beds	542	97.7%	13	2.3%	555
Medical/Surgical -All other, >15 beds	746	96.9%	24	3.1%	770
Neurologic	84	100.0%			84
Neurosurgical	443	99.3%	3	0.7%	446
Pediatric cardiothoracic	21	100.0%			21
Pediatric medical	6	100.0%			6
Pediatric medical/surgical	126	99.2%	1	0.8%	127
Surgical -Major teaching	464	98.5%	7	1.5%	471
Surgical -All other	182	100.0%			182
Surgical cardiothoracic	367	98.9%	4	1.1%	371
Trauma	483	99.0%	5	1.0%	488
Specialty Care Areas					
Bone marrow transplant	9	100.0%			9
Hematology/oncology	96	99.0%	1	1.0%	97
Long Term Acute Care*					
Long-term acute care	532	96.4%	20	3.6%	552
Step-down Units					
Adult step-down (post-critical care)	487	98.8%	6	1.2%	493
Pediatric step-down (post critical care)	2	100.0%			2
Inpatient Wards					
Acute stroke	2	100.0%			2
Behavioral health/psychiatry	13	100.0%			13
Genitourinary	10	100.0%			10
Gerontology	4	100.0%			4
Gynecology	10	100.0%			10
Labor and delivery	6	100.0%			6
Labor, delivery, recovery, postpartum suite	16	100.0%			16
Medical	532	98.9%	6	1.1%	538
Medical/Surgical	1,230	98.1%	24	1.9%	1,254
Neurologic	49	100.0%			49
Neurosurgical	76	100.0%			76
Orthopedic	162	99.4%	1	0.6%	163
Orthopedic trauma	6	100.0%			6
Pediatric medical/surgical	18	100.0%			18
Pediatric medical	2	100.0%			2
Postpartum	20	100.0%			20
Pulmonary	18	94.7%	1	5.3%	19
Rehabilitation	246	99.2%	2	0.8%	248
Pediatric rehabilitation	2	100.0%			2
Surgical	356	98.3%	6	1.7%	362
Telemetry	11	100.0%			11
Vascular surgery	20	95.2%	1	4.8%	21

Inpatient Long Term Care					
Chronic care [¥]	9	100.0%			9
Total	9,387	98.3%	165	1.7%	9,552

UTI, urinary tract infection; SUTI, symptomatic UTI; ABUTI, asymptomatic bacteremic UTI.⁷

* Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

[¥] Includes inpatient long term care locations within the general acute care hospital setting.

Table 14. Distribution of specific sites of ventilator-associated pneumonia by location, 2010

Type of location	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
Critical Care Units							
Burn	33	37.1%	55	61.8%	1	1.1%	89
Medical -Major teaching	142	68.3%	60	28.8%	6	2.9%	208
Medical -All other	88	66.7%	42	31.8%	2	1.5%	132
Medical cardiac	79	60.3%	52	39.7%			131
Medical/surgical -Major teaching	166	54.1%	135	44.0%	6	2.0%	307
Medical/surgical -All other ≤15 beds	192	75.0%	60	23.4%	4	1.6%	256
Medical/surgical -All other >15 beds	208	53.7%	168	43.4%	11	2.8%	387
Neurologic	34	47.9%	37	52.1%			71
Neurosurgical	100	60.6%	65	39.4%			165
Pediatric cardiothoracic	12	60.0%	8	40.0%			20
Pediatric medical	10	100.0%					10
Pediatric medical/surgical	82	68.3%	36	30.0%	2	1.7%	120
Surgical -Major teaching	199	53.2%	171	45.7%	4	1.1%	374
Surgical -All other	80	44.2%	96	53.0%	5	2.8%	181
Surgical cardiothoracic	128	58.7%	78	35.8%	12	5.5%	218
Trauma	245	44.1%	307	55.3%	3	0.5%	555
Long Term Acute Care*							
Adult long-term acute care	53	80.3%	13	19.7%			66
Step-Down Units							
Adult step-down (post-critical care)	24	85.7%	3	10.7%	1	3.6%	28
Inpatient Wards							
Medical	1	100.0%					1
Medical/surgical	5	83.3%	1	16.7%			6
Neurosurgical	2	100.0%					2
Pediatric medical/surgical	1	100.0%					1
Pulmonary	1	14.3%	6	85.7%			7
Total	1,885	56.52%	1,393	41.77%	57	1.71%	3,335

PNU1, clinically defined pneumonia; PNU2, pneumonia with specific laboratory findings; PNU3, pneumonia in immunocompromised patients.⁷

* Includes free-standing long-term acute care hospitals and long-term acute care locations within the general acute care hospital setting.

Table 15. Distribution of specific sites and criteria for central line-associated laboratory-confirmed BSI among Level III NICUs by birthweight, 2010

Birth-weight category	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
≤ 750 grams	214	66.9%	106	33.1%	320
750-1000 grams	155	63.5%	89	36.5%	244
1001-1500 grams	100	70.9%	41	29.1%	141
1501-2500 grams	80	82.5%	17	17.5%	97
> 2500 grams	65	73.0%	24	27.0%	89
Total	614	68.9%	277	31.1%	891

BSI, bloodstream infection; LCBI, laboratory-confirmed BSI.⁷

Table 16. Distribution of specific sites and criteria for central line-associated laboratory-confirmed BSI among Level II/III NICUs by birthweight, 2010

Birth-weight category	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
≤ 750 grams	103	64.0%	58	36.0%	161
750-1000 grams	64	56.1%	50	43.9%	114
1001-1500 grams	53	60.2%	35	39.8%	88
1501-2500 grams	38	70.4%	16	29.6%	54
> 2500 grams	26	68.4%	12	31.6%	38
Total	284	62.4%	171	37.6%	455

BSI, bloodstream infection; *LCBI*, laboratory-confirmed BSI.⁷

Table 17. Distribution of specific sites of ventilator-associated pneumonia among Level III NICUs by birthweight, 2010

Birth-weight category	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
≤ 750 grams	57	85.1%	10	14.9%			67
750-1000 grams	19	73.1%	7	26.9%			26
1001-1500 grams	12	85.7%	2	14.3%			14
1501-2500 grams	6	85.7%	1	14.3%			7
> 2500 grams	9	81.8%	2	18.2%			11
Total	103	82.4%	22	17.6%	0	0.0%	125

PNU1, clinically defined pneumonia; *PNU2*, pneumonia with specific laboratory findings; *PNU3*, pneumonia in immunocompromised patients.⁷

Table 18. Distribution of specific sites of ventilator-associated pneumonia among Level II/III NICUs by birthweight, 2010

Birth-weight category	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
≤ 750 grams	29	80.6%	7	19.4%			36
750 -1000 grams	15	83.3%	2	11.1%	1	5.6%	18
1001-1500 grams	6	85.7%			1	14.3%	7
1501-2500 grams	3	100.0%					3
> 2500 grams			2	100.0%			2
Total	53	80.3%	11	16.7%	2	3.0%	66

PNU1, clinically defined pneumonia; *PNU2*, pneumonia with specific laboratory findings; *PNU3*, pneumonia in immunocompromised patients.⁷

Appendix A.

How to calculate a device-associated infection rate and device utilization ratio with Device-associated Module data

Calculation of Device-associated Infection Rate

Step 1: Decide upon the time period for your analysis. It may be a month, a quarter, 6 months, a year, or some other period.

Step 2: Select the patient population for analysis, e.g., the type of location or a birthweight category in a NICU.

Step 3: Select the infections to be included in the numerator. They must be site-specific and must have occurred in the selected patient population. Their date of onset must be during the selected time period.

Step 4: Determine the number of device-days which is used as the denominator of the rate. Device-days are the total number of days of exposure to the device (central line, umbilical catheter, ventilator, or urinary catheter) by all of the patients in the selected population during the selected time period.

Example: Five patients on the first day of the month had one or more central lines in place; five on day 2; two on day 3; five on day 4; three on day 5; four on day 6; and four on day 7. Adding the number of patients with central lines on days 1 through 7, we would have $5+5+2+5+3+4+4=28$ central line-days for the first week. If we continued for the entire month, the number of central line-days for the month is simply the sum of the daily counts.

Step 5: Calculate the device-associated infection rate (per 1000 device-days) using the following formula:

$$\text{Device-associated Infection Rate} = \frac{\text{Number of device-associated infections for an infection site} \times 1000}{\text{Number of device-days}}$$

Example: **Central line-associated BSI rate per 1000 central line-days =**
$$\frac{\text{Number of central line-associated BSI} \times 1000}{\text{Number of central line-days}}$$

Calculation of Device Utilization (DU) Ratio

Steps 1,2,4: Same as device-associated infection rates plus determine the number of patient-days which is used as the denominator of the DU ratio. Patient-days are the total number of days that patients are in the location during the selected time period.

Example: Ten patients were in the unit on the first day of the month; 12 on day 2; 11 on day 3; 13 on day 4; 10 on day 5; 6 on day 6; and 10 on day 7; and so on. If we counted the patients in the unit from days 1 through 7, we would add $10 + 12 + 11 + 13 + 10 + 6 + 10$ for a total of 72 patient-days for the first week of the month. If we continued for the entire month, the number of patient-days for the month is simply the sum of the daily counts.

Step 5: Calculate the DU ratio with the following formula:

$$\text{DU Ratio} = \frac{\text{Number of device-days}}{\text{Number of patient-days}}$$

With the number of device-days and patient-days from the examples above,
 $DU = 28/72 = 0.39$ or 39% of patient-days were also central line-days for the first week of the month.

Step 6: Examine the size of the denominator for your hospital's rate or ratio. Rates or ratios may not be good estimates of the "true" rate or ratio for your hospital if the denominator is small, i.e., <50 device-days or patient-days.

Step 7: Compare your hospital's location-specific rates or ratios with those found in the tables of this report. Refer to Appendix B for interpretation of the percentiles of the rates/ratios.

Appendix B.

Interpretation of percentiles of infection rates or device utilization ratios

- Step 1:** Evaluate the rate (ratio) you have calculated for your hospital and confirm that the variables in the rate (both numerator and denominator) are identical to the rates (ratios) in the table.
- Step 2:** Examine the percentiles in each of the tables and look for the 50th percentile (or median). At the 50th percentile, 50% of the hospitals have lower rates (ratios) than the median and 50% have higher rates (ratios).
- Step 3:** Determine if your hospital's rate (ratio) is above or below this median.

Determining whether your hospital's rate or ratio is a HIGH outlier

- Step 4:** If it is above the median, determine whether the rate (ratio) is above the 75th percentile. At the 75th percentile, 75% of the hospitals had lower rates (ratios) and 25% of the hospital had higher rates (ratios).
- Step 5:** If the rate (ratio) is above the 75th percentile, determine whether it is above the 90th percentile. If it is, then the rate (ratio) is an outlier which *may* indicate a problem.

Determining whether your hospital's rate or ratio is a LOW outlier

- Step 6:** If it is below the median, determine whether the rate (ratio) is below the 25th percentile. At the 25th percentile, 25% of the hospitals had lower rates (ratios) and 75% of the hospitals had higher rates (ratios).
- Step 7:** If the rate (ratio) is below the 25th percentile, determine whether it is below the 10th percentile. If it is, then it is a low outlier which may be due to underreporting of infections. If the ratio is below the 10th percentile, it is a low outlier and may be due to infrequent and/or short duration of device use.

Note: Device-associated infection rates and device utilization ratios should be examined together so that preventive measures may be appropriately targeted. For example, you find that the ventilator-associated pneumonia rate for a certain type of ICU is consistently above the 90th percentile and the ventilator utilization ratio is routinely between the 75th and 90th percentile. Since the ventilator is a significant risk factor for pneumonia, you may want to limit the duration of ventilation whenever possible (i.e., decrease unnecessary use) while at the same time optimize infection prevention strategies in patients for which ventilator use is required.

References

- 1 Dudeck MA, Horan TC, Peterson KD, Allen-Bridson K, Morrell GC, Pollock DA, Edwards JR. National Healthcare Safety Network (NHSN) report, data summary for 2009, device-associated module. *Am J Infect Control* 2011; 39:349-367.
- 2 Centers for Disease Control and Prevention. State-specific HAI standardized infection ratio (SIR) report, January-June 2009. Available from: http://www.cdc.gov/HAI/pdfs/stateplans/SIR_05_25_2010.pdf. Accessed September 14, 2011.
- 3 Centers for Disease Control and Prevention. National HAI standardized infection ratio (SIR) report, July-December 2009. Available from: http://www.cdc.gov/HAI/pdfs/stateplans/SIR-2010_JunDec2009.pdf. Accessed September 14, 2011.
- 4 Centers for Disease Control and Prevention. State-specific supplement to the national healthcare-associated infection standardized infection ratio (SIR) report: July 2009 through December 2009. Available from: <http://www.cdc.gov/HAI/pdfs/stateplans/state-specific-hai-sir-july-dec2009r.pdf>. Accessed September 14, 2011.
- 5 Centers for Disease Control and Prevention. Outline for healthcare-associated infection surveillance. Available from: <http://www.cdc.gov/nhsn/PDFS/OutlineForHAISurveillance.pdf>. Accessed September 14, 2011.
- 6 Centers for Disease Control and Prevention. NHSN manual: patient safety component protocols. Available from: http://www.cdc.gov/nhsn/TOC_PSCManual.html. Accessed September 14, 2011.
- 7 Centers for Disease Control and Prevention. Surveillance definition of healthcare-associated infection and criteria for specific types of infections in the acute care setting. Available from: http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf. Accessed September 14, 2011.
- 8 Klevens RM, Edwards JR, Andrus ML, Peterson KD, Dudeck MA, Horan TC and the NHSN participants in Outpatient Dialysis Surveillance. *Dialysis Surveillance Report: National Healthcare Safety Network (NHSN)--Data Summary for 2006. Seminars in Dialysis* 2008;21(1):24-28.
- 9 Jarvis WR, Edwards JR, Culver DH, Hughes JM, Horan T, Emori TG, et al. Nosocomial infection rates in adult and pediatric intensive care units in the United States. *Am J Med* 1991;91(Suppl 3B):185S-91S.
- 10 U. S. Department of Health and Human Services. HHS action plan to prevent healthcare-associated infections. Available from: <http://www.hhs.gov/ash/initiatives/hai/actionplan/index.html>. Accessed September 14, 2011.