



National Healthcare Safety Network (NHSN) Report, Data Summary for 2011, 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 2011 and reported to the Centers for Disease Control and Prevention (CDC) by August 1, 2012. 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 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 for the data to be included in CDC

analyses. 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, in response to state mandatory reporting requirements or in compliance with the Centers for Medicare and Medicaid Services' (CMS) Hospital Inpatient Quality Reporting (IQR) Program. CDC aggregated these data into a single national database for 2011, consistent with the stated purposes of NHSN, 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 infection [HAI] and pathogens, assess the importance of potential risk factors, further characterize HAI pathogens and their mechanisms of resistance, and evaluate alternative surveillance and prevention strategies).
- Comply with legal requirements – including but not limited to state or federal laws, regulations, or other requirements – for mandatory reporting of healthcare facility-specific adverse event, prevention practice adherence, and other public health data.
- Enable healthcare facilities to report HAI and prevention practice adherence data via NHSN to the U.S. Centers for Medicare and Medicaid Services (CMS) in fulfillment of CMS's quality measurement reporting requirements for those data.



- Provide state departments of health with information that identifies the healthcare facilities in their state that participate in NHSN.
- Provide to state agencies, at their request, facility-specific, NHSN patient safety component and healthcare personnel safety component adverse event and prevention practice adherence data for surveillance, prevention, or mandatory public reporting.

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, federal reporting programs, and prevention initiatives, to collect data on central line-associated primary bloodstream infections (CLABSI), ventilator-associated pneumonias (VAP), 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, locations are further stratified 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,

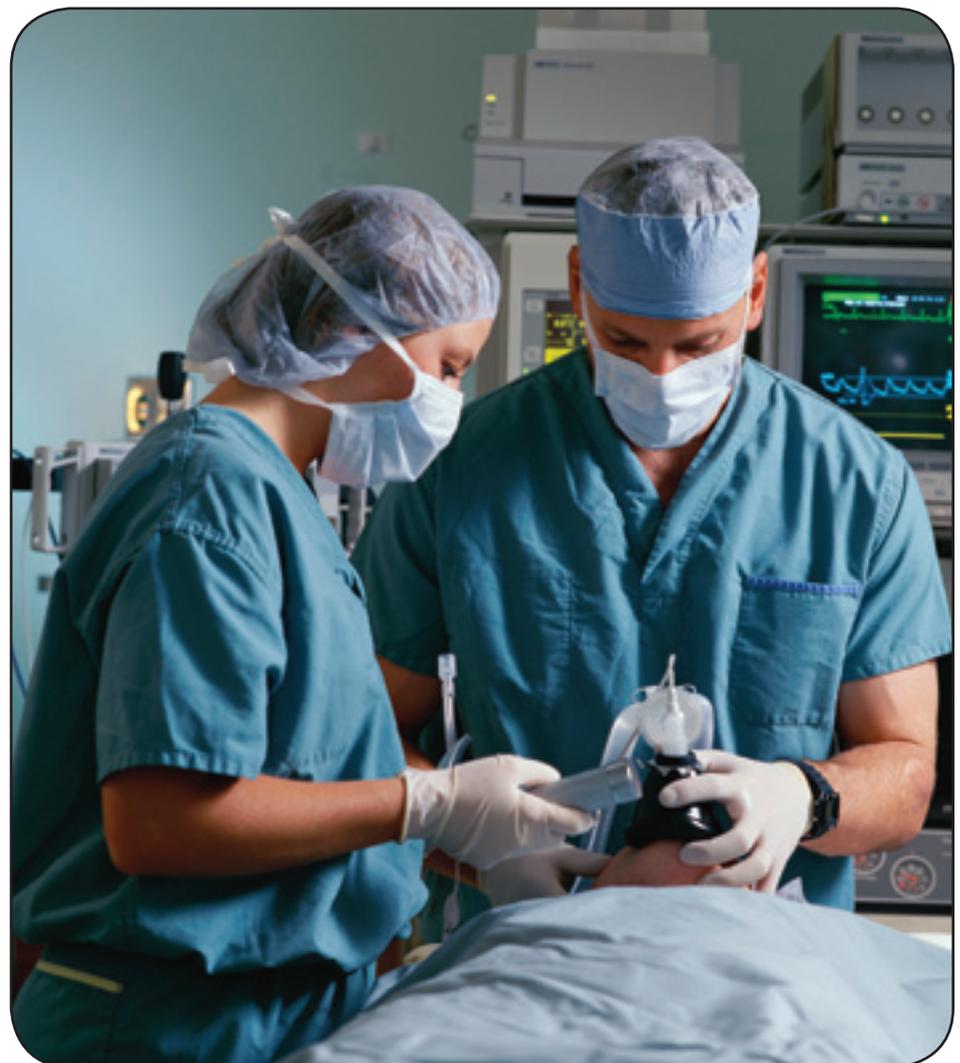
and >2500 g); data on CAUTI are not collected as part of the NHSN protocols in any NICU location. Corresponding location-specific denominator data consisting of patient-days and specific device-days are also collected by IPs or other trained personnel.

In non-NICU locations, the device-days consist of the total number of central line-days, urinary catheter-days, or ventilator-days. For specialty care areas, such as hematology/oncology and hematopoietic stem cell transplant locations, central line days are split into those with only a permanent central line vs. those with temporary central lines (with or without a permanent central line). 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

Compared to the previous report, five new locations – pediatric surgical critical care, long term care rehabilitation unit, long term acute care critical care, long term acute care ward, and inpatient rehabilitation facility– had sufficient data to be included in this report.¹

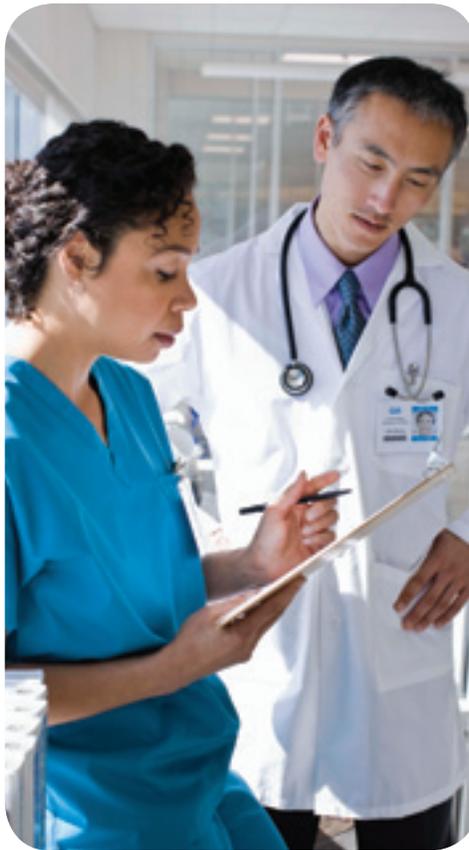
Locations were further stratified by unit bed size and/or major teaching status to determine if pooled mean rates, medians, and empirical distributions significantly differed between two groups for all DA infections; if differences were present, the strata were retained for reporting. Comparisons of 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.

Existing strata were retained for adult combined medical/surgical ICUs, medical ICUs, and surgical ICUs. The data for adult combined medical/surgical ICUs were split by hospital type and unit bedsize, resulting in three groups: “major teaching,” “all others” with unit bedsize ≤ 15 beds, and “all others” with unit bedsize > 15 . The data for adult medical ICUs and adult surgical ICUs were split into two groups by teaching status. 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. Adult bone marrow transplant and adult hematology/oncology locations were also evaluated to assess importance of status as an oncology hospital, but differences were not significant and no new strata were retained.

Device utilization (DU) was calculated as a ratio of device days to patient days for each location type. As such, the DU of a location is one measure of the use of invasive devices and constitutes an extrinsic risk factor for healthcare-associated infection.⁹ DU may also serve as a marker for severity of illness of patients (i.e. more



severely ill patients are more likely to require an invasive device) which is another reflection of the intrinsic susceptibility to infection.

Data from at least 5 different reporting units of a given location type were used to determine pooled mean DA infection rates and DU ratios. Percentile distributions were determined if there were data from at least 20 different locations, excluding rates or DU ratios for locations that did not report at least 50 device-days or patient-days. Because of these requirements, the number of locations contributing data may vary among the tables.

Results

In 2011, 3,854 hospitals reported at least one month of DA denominator data for some patient cohorts under surveillance. These 3,854 hospitals were located in 53 states, territories, 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 (65%), and only 10.9% were categorized as major teaching facilities (Table 2). Additionally, 60% 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 2011 (Tables 3-10). Data on the specific criteria used to report 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 Beginning in 2012, long term acute care (LTAC) units were re-categorized by acuity level into critical care or ward designations; therefore, in order to align with current data reporting methods in this location type, LTAC data in this report have been categorized in the same manner. Additionally, data from inpatient rehabilitation facilities (IRFs), as defined by the Centers for Medicare and Medicaid Services (CMS), have been reported separately from non-IRF rehabilitation wards within acute care hospitals.

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 are no longer collected according to central line type (i.e., central line and umbilical catheter); in order to align with the current reporting of these data, CLABSI rates and DU ratios for NICUs are not stratified by line type in this report.

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.

Discussion

This report summarizes the HAI data reported to the DA module of NHSN during 2011. The data in this report continue to be restricted to a single year for several reasons. First, NHSN saw continued growth in participation due to state mandates and federal reporting programs and because of this, there were sufficient data reported in 2011 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, analyzing one year of data removes the need to assess the influence of any large increase of new reporters in a single year of a multiyear summary measure. Finally, by restricting data to a single year, changes 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 are similar to those seen in the last published report, although this report demonstrates a slight increase in contribution from smaller hospitals.¹ Based on the number of facilities reporting, overall contribution to the device-associated module increased by 56% from the last report.¹ This increase in reporting is largely attributed to hospitals' participation in the CMS Hospital Inpatient Quality Reporting Program which requires participants to use NHSN as the tool to report CLABSI data from all adult, pediatric, and neonatal ICUs beginning in January 2011. While much of this growth impacted the volume of CLABSI reporting in ICUs, there is an indication of increased participation in non-ICU locations for CLABSI reporting, as well as reporting for other HAIs in this module.

Extensive analyses of the impact of hospital type on all DA infection rates were performed for select ICU locations. Hospital type continues to be a significant factor for all three DA infection rates and percentile distributions in medical ICUs and surgical ICUs. Additionally, hospital type and bed size both continue to be significant factors in DA infection rates for medical/surgical ICUs. Note that while the CLABSI rates between unit bedsize strata in medical/surgical "all other" ICUs are equal (Table 3), the percentile distributions were shown to be significantly different as a result of nonparametric statistical tests. Therefore, this stratification by unit bedsize in "all other" medical/surgical ICUs was retained. Adult bone marrow transplant and adult hematology/oncology locations were not further stratified by hospital type (i.e., oncology hospital vs. all other acute care hospitals) as the results of the statistical tests indicated that the differences in the strata were not statistically significant. Beginning in 2013, oncology hospitals will be provided with fourteen oncology-specific CDC locations with which to identify

for device-associated infection surveillance. As the volume of these data become sufficient, future analyses will continue to assess any potential differences in this specialized population.

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 criterion nationally. For example, approximately 82% of the CLABSIs from adult and pediatric ICU and inpatient wards were identified using the least subjective criterion (1) which attributes the CLABSI to a recognized pathogen; however, for NICUs, approximately two-thirds used this criterion, resulting in a greater percentage of CLABSIs in this population that were identified with common commensals. Similarly, the specific type of ventilator-associated pneumonia (VAP) most frequently reported, regardless of location, was the clinical criterion (PNU1) which relies on the somewhat subjective interpretations of clinical findings.





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.

To improve the reliability of data reported to NHSN, several protocol changes are set to occur in January 2013. The majority of these changes are with respect to timing and implementation of two-day rules to clarify infections that are healthcare-associated, association of device use to HAI, and attribution of HAI to an inpatient location after transfer or to a hospital after discharge. In addition, NHSN will add criteria for mucosal barrier injury laboratory-confirmed bloodstream infections. Finally, the VAP definition

will no longer apply to adult patients (i.e., ≥ 18 years of age) and this definition will be replaced by ventilator-associated events (VAEs).¹⁰ We will carefully assess the potential impact of these changes on HAI incidence as these data are reported.

For those who 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 interpretation of percentiles of infection rates or DU ratios. Although a high rate or ratio (>90 th percentile) does not necessarily define a problem, it does suggest an area for further investigation. Similarly, a low rate or ratio (<10 th 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 data presented in this report can be used to prioritize prevention efforts in those patient care areas that are shown to have the highest incidence of DA infections and/or high device utilization. Facilities may also wish to set targets based on the percentile distributions provided in this report in an effort to strive for lower rates and greater prevention success.

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	62 (1.6)
General, including acute, trauma, and teaching	3,426 (88.9)
Long Term Acute Care	192 (5.0)
Military	25 (0.6)
Oncology	10 (0.3)
Orthopedic	13 (0.3)
Psychiatric	10 (0.3)
Rehabilitation	44 (1.1)
Surgical	41 (1.1)
Veterans Affairs	16 (0.4)
Women's	5 (0.1)
Women's and Children's	10 (0.3)
Total	3,854 (100.0)

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	104 (2.7)	185 (4.8)	123 (3.2)	9 (0.2)	421 (10.9)
Graduate teaching	125 (3.2)	153 (4.0)	35 (0.9)	3 (0.1)	316 (8.2)
Limited teaching	193 (5.0)	157 (4.1)	30 (0.8)	1 (0.0)	381 (9.9)
Nonteaching	2,085 (54.1)	594 (15.4)	55 (1.4)	2 (0.0)	2736 (71.0)
Total	2,807 (65.0)	1,089 (28.3)	243 (6.3)	15 (0.4)	3,854 (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, 2011

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%
Acute Care Hospitals									
Critical Care									
Burn	71 (70)	301	80,426	3.7	0.0	1.2	2.8	5.8	8.4
Medical -Major teaching	198 (197)	703	563,577	1.2	0.0	0.4	1.1	1.8	2.9
Medical -All other	476 (451)	769	675,620	1.1	0.0	0.0	0.5	1.6	2.9
Medical cardiac	423 (415)	673	605,187	1.1	0.0	0.0	0.8	1.7	2.8
Medical/surgical -Major teaching	304 (300)	937	693,570	1.4	0.0	0.0	1.1	1.9	3.1
Medical/surgical -All other ≤15 beds	1,860 (1669)	1,246	1,416,501	0.9	0.0	0.0	0.0	1.1	2.5
Medical/surgical -All other > 15 beds	800 (795)	1,959	2,174,055	0.9	0.0	0.2	0.7	1.4	2.2
Neurologic	50	76	76,580	1.0	0.0	0.0	0.7	1.6	2.2
Neurosurgical	166	309	300,009	1.0	0.0	0.0	0.8	1.6	2.3
Pediatric cardiothoracic	38	180	110,127	1.6	0.0	1.1	1.6	2.1	2.7
Pediatric medical	36 (29)	34	24,777	1.4	0.0	0.0	0.0	1.6	2.7
Pediatric medical/surgical	300 (281)	717	403,728	1.8	0.0	0.0	1.3	2.6	4.1
Pediatric surgical	6 (5)	3	3,473	0.9					
Prenatal	8 (3)	0	330	0.0					
Respiratory	10	8	14,524	0.6					
Surgical -Major teaching	161	514	435,010	1.2	0.0	0.2	1.0	1.9	3.1
Surgical -All other	218 (214)	429	419,669	1.0	0.0	0.0	0.8	1.6	2.8
Surgical cardiothoracic	457 (456)	762	934,275	0.8	0.0	0.0	0.5	1.1	1.9
Trauma	140	511	328,713	1.6	0.0	0.5	1.3	2.4	3.3
Step-Down Units									
Adult step-down (post-critical care)	502 (493)	588	607,681	1.0	0.0	0.0	0.0	1.2	2.5
Step-down NICU (level II)	42 (20)	8	5,366	1.5	0.0	0.0	0.0	0.0	1.0
Pediatric step-down (post-critical care)	11	19	9,430	2.0					
Inpatient Wards									
Acute stroke	17	10	12,742	0.8					
Antenatal	11 (4)	1	1,988	0.5					
Behavioral health/psychiatry	94 (29)	4	7,253	0.6	0.0	0.0	0.0	0.0	0.2
Burn	15	5	6,451	0.8					
Genitourinary	13	19	20,684	0.9					
Geronotology	9 (8)	7	7,050	1.0					
Gynecology	47 (26)	7	13,137	0.5	0.0	0.0	0.0	0.0	0.7
Jail	17 (16)	11	9,875	1.1					
Labor and delivery	48 (7)	0	950	0.0					
Labor, delivery, recovery, postpartum suite	89 (14)	1	3,223	0.3					
Medical	770 (735)	908	963,923	0.9	0.0	0.0	0.3	1.5	2.9
Medical/surgical	1,892 (1,756)	1,606	1,844,384	0.9	0.0	0.0	0.0	1.2	2.4
Neurologic	49 (48)	44	56,575	0.8	0.0	0.0	0.0	1.1	2.5
Neurosurgical	57 (56)	47	59,918	0.8	0.0	0.0	0.0	0.8	2.0
Orthopedic	242 (213)	98	158,131	0.6	0.0	0.0	0.0	0.8	1.6
Orthopedic trauma	15	32	18,907	1.7					
Pediatric medical	47 (42)	62	50,476	1.2	0.0	0.0	0.0	1.6	2.9
Pediatric medical/surgical	241 (185)	197	170,549	1.2	0.0	0.0	0.0	1.6	3.5
Pediatric rehabilitation	8	7	6,737	1.0					
Pediatric surgical	11	21	16,215	1.3					
Postpartum	128 (11)	1	2,648	0.4					

Pulmonary	31	52	55,230	0.9	0.0	0.0	0.7	1.4	2.3
Rehabilitation - non-IRF ¹¹	71 (65)	10	32,617	0.3	0.0	0.0	0.0	0.0	1.4
Surgical	444 (421)	410	506,033	0.8	0.0	0.0	0.0	1.1	2.3
Telemetry	225 (219)	188	219,853	0.9	0.0	0.0	0.0	1.4	3.0
Vascular Surgery	23	14	35,321	0.4	0.0	0.0	0.0	0.7	1.2
Well-Baby Nursery	16 (5)	2	640	3.1					
Inpatient Long Term Care⁹									
Chronic care	15 (13)	5	11,338	0.4					
Ventilator dependent unit	6	19	10,806	1.8					
Long-Term Acute Care Hospitals[‡]									
Adult critical care	18	76	38,805	2.0					
Adult Ward	229 (227)	1,431	1,205,212	1.2	0.0	0.3	1.0	1.8	2.9
Inpatient Rehabilitation Facilities[¶]									
Adult rehabilitation units - Freestanding	77 (73)	23	51,943	0.4	0.0	0.0	0.0	0.4	1.7
Adult rehabilitation units - Within hospital	167 (162)	43	77,585	0.6	0.0	0.0	0.0	0.0	2.5

Type of Location	Central line utilization ratio**				Percentile				
	No. of locations+	Central line-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals									
Critical Care									
Burn	71 (70)	80,426	172,984	0.46	0.22	0.35	0.45	0.57	0.78
Medical -Major teaching	198	563,577	913,585	0.62	0.42	0.54	0.62	0.70	0.78
Medical -All other	476 (471)	675,620	1,487,717	0.45	0.13	0.25	0.43	0.58	0.71
Medical cardiac	423 (422)	605,187	1,427,575	0.42	0.19	0.29	0.42	0.56	0.68
Medical/surgical -Major teaching	304 (303)	693,570	1,291,401	0.54	0.26	0.42	0.55	0.66	0.74
Medical/surgical -All other ≤15 beds	1,860 (1,822)	1,416,501	4,069,614	0.35	0.10	0.18	0.33	0.50	0.63
Medical/surgical -All other > 15 beds	800	2,174,055	4,420,558	0.49	0.30	0.40	0.51	0.61	0.71
Neurologic	50	76,580	152,036	0.50	0.23	0.37	0.48	0.59	0.70
Neurosurgical	166	300,009	683,553	0.44	0.28	0.36	0.45	0.54	0.62
Pediatric cardiothoracic	38	110,127	156,466	0.70	0.48	0.61	0.73	0.86	0.91
Pediatric medical	36 (34)	24,777	65,428	0.38	0.07	0.15	0.25	0.44	0.53
Pediatric medical/surgical	300 (295)	403,728	866,685	0.47	0.14	0.25	0.39	0.53	0.61
Pediatric surgical	6	3,473	8,516	0.41					
Prenatal	8	330	7,408	0.04					
Respiratory	10	14,524	30,748	0.47					
Surgical -Major teaching	161	435,010	699,783	0.62	0.41	0.52	0.60	0.72	0.80
Surgical -All other	218 (215)	419,669	746,500	0.56	0.37	0.46	0.56	0.68	0.77
Surgical cardiothoracic	457	934,275	1,425,711	0.66	0.40	0.50	0.67	0.81	0.91
Trauma	140	328,713	601,489	0.55	0.36	0.45	0.57	0.65	0.72
Step-Down Units									
Adult step-down (post-critical care)	502 (499)	607,681	2,949,613	0.21	0.08	0.12	0.18	0.29	0.41
Step-down NICU (level II)	42 (41)	5,366	52,925	0.10	0.02	0.04	0.07	0.13	0.17
Pediatric step-down (post-critical care)	11	9,430	37,574	0.25					
Inpatient Wards									
Acute stroke	17	12,742	93,295	0.14					
Antenatal	11	1,988	42,651	0.05					
Behavioral health/psychiatry	94	7,253	228,529	0.03	0.01	0.01	0.02	0.03	0.05
Burn	15	6,451	35,906	0.18					
Genitourinary	13	20,684	85,847	0.24					
Geronatology	9	7,050	57,819	0.12					

Gynecology	47	13,137	123,917	0.11	0.01	0.01	0.04	0.13	0.29
Jail	17	9,875	55,242	0.18					
Labor and delivery	48 (45)	950	44,530	0.02	0.00	0.01	0.01	0.03	0.11
Labor, delivery, recovery, postpartum suite	89 (88)	3,223	121,634	0.03	0.00	0.01	0.02	0.03	0.04
Medical	770 (766)	963,923	5,421,265	0.18	0.06	0.10	0.15	0.22	0.32
Medical/surgical	1,892 (1,888)	1,844,384	12,356,081	0.15	0.04	0.07	0.12	0.18	0.25
Neurologic	49	56,575	366,417	0.15	0.07	0.11	0.13	0.19	0.25
Neurosurgical	57	59,918	401,591	0.15	0.07	0.09	0.15	0.20	0.25
Orthopedic	242 (241)	158,131	1,478,952	0.11	0.02	0.05	0.09	0.13	0.18
Orthopedic trauma	15	18,907	114,147	0.17					
Pediatric medical	47 (46)	50,476	212,541	0.24	0.03	0.09	0.18	0.31	0.37
Pediatric medical/surgical	241 (239)	170,549	923,148	0.18	0.03	0.04	0.11	0.23	0.32
Pediatric rehabilitation ^{ll}	8	6,737	32,984	0.20					
Pediatric surgical	11	16,215	64,153	0.25					
Postpartum	128	2,648	258,807	0.01	0.00	0.00	0.01	0.01	0.03
Pulmonary	31	55,230	233,443	0.24	0.10	0.15	0.21	0.31	0.45
Rehabilitation - non-IRF ^{ll}	71	32,617	302,440	0.11	0.04	0.06	0.08	0.14	0.25
Surgical	444 (440)	506,033	2,955,338	0.17	0.05	0.09	0.15	0.21	0.27
Telemetry	225 (223)	219,853	1,646,413	0.13	0.06	0.09	0.13	0.17	0.22
Vascular Surgery	23	35,321	158,729	0.22	0.09	0.14	0.19	0.31	0.45
Well-Baby Nursery	16	640	15,265	0.04					
Inpatient Long Term Care[§]									
Chronic care	15 (13)	11,338	67,078	0.17					
Ventilator dependent unit	6	10,806	33,390	0.32					
Long-Term Acute Care Hospitals[‡]									
Adult critical care	18	38,805	69,278	0.56					
Adult Ward	229	1,205,212	1,901,569	0.63	0.43	0.54	0.69	0.79	0.87
Inpatient Rehabilitation Facilities[¶]									
Adult rehabilitation units - Freestanding	77	51,943	694,684	0.07	0.03	0.04	0.06	0.09	0.13
Adult rehabilitation units - Within hospital	167	77,585	761,155	0.10	0.04	0.06	0.08	0.13	0.18

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.

ll Includes only in-hospital rehabilitation wards that are not defined as inpatient rehabilitation facilities (IRF) per the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

¶ Includes free-standing inpatient rehabilitation facilities and inpatient rehabilitation facilities within the acute care hospital setting, as defined by the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

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 speciality care area/oncology location, DA module, 2011

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/Oncology									
Hematopoietic stem cell transplant	49 (48)	285	117,264	2.4	0.0	0.9	1.9	3.8	5.3
General hematology/oncology	163 (162)	400	295,200	1.4	0.0	0.0	1.0	1.9	3.1
Pediatric hematopoietic stem cell transplant	13	67	30,530	2.2					
Pediatric general hematology/oncology	40	212	127,444	1.7	0.0	0.6	1.6	2.2	3.3
Solid organ transplant	19 (15)	27	16,448	1.6					

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/Oncology									
Hematopoietic stem cell transplant	48 (47)	204	87,507	2.3	0.0	0.9	1.8	3.2	4.7
General hematology/oncology	170 (169)	475	243,144	2.0	0.0	0.0	1.4	2.8	4.7
Pediatric hematopoietic stem cell transplant	11 (8)	11	5,193	2.1					
Pediatric general hematology/oncology	41 (39)	84	37,815	2.2	0.0	0.0	1.0	3.3	4.8
Solid organ transplant	19	58	34,735	1.7					

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/Oncology									
Hematopoietic stem cell transplant	49	117,264	227,282	0.52	0.16	0.28	0.50	0.67	0.81
General hematology/oncology	163	295,200	984,067	0.30	0.12	0.18	0.28	0.40	0.53
Pediatric hematopoietic stem cell transplant	13	30,530	39,571	0.77					
Pediatric general hematology/oncology	40	127,444	206,284	0.62	0.34	0.44	0.59	0.79	0.84
Solid organ transplant	19 (18)	16,448	101,176	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/Oncology									
Hematopoietic stem cell transplant	48	87,507	210,124	0.42	0.10	0.28	0.40	0.62	0.74
General hematology/oncology	170	243,144	1,045,450	0.23	0.08	0.14	0.21	0.32	0.44
Pediatric hematopoietic stem cell transplant	11	5,193	29,099	0.18					
Pediatric general hematology/oncology	41	37,815	198,657	0.19	0.05	0.07	0.13	0.31	0.41
Solid organ transplant	19	34,735	111,538	0.31					

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, 2011

Type of Location	Urinary catheter-associated UTI rate*				Percentile				
	No. of locations+	No. of CAUTI	Urinary catheter-days	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals									
Critical Care Units									
Burn	38	148	36,222	4.1	0.0	0.0	2.8	5.2	8.6
Medical									
-Major teaching	99	739	287,880	2.6	0.0	0.7	2.0	3.4	5.0
Medical									
-All other	212 (202)	552	350,509	1.6	0.0	0.0	0.7	2.1	3.5
Medical cardiac	211 (207)	596	301,884	2.0	0.0	0.0	1.3	2.9	5.0
Medical/surgical									
-Major teaching	146 (145)	827	381,416	2.2	0.0	0.1	1.6	2.8	4.5
Medical/surgical									
-All other ≤15 beds	793 (748)	921	750,795	1.2	0.0	0.0	0.0	1.6	3.5
Medical/surgical									
-All other > 15 beds	405	1,685	1,181,301	1.4	0.0	0.4	1.1	2.1	3.1
Neurologic	21	116	34,422	3.4	0.0	1.5	2.5	4.9	6.6
Neurosurgical	74	812	181,986	4.5	0.0	1.8	3.8	5.5	8.1
Pediatric cardiothoracic	10 (9)	12	8,764	1.4					
Pediatric medical	11 (10)	5	1,736	2.9					
Pediatric medical/surgical	129 (110)	217	70,607	3.1	0.0	0.0	0.8	3.5	8.0
Prenatal	6 (2)	1	781	1.3					
Respiratory	6	11	7,869	1.4					
Surgical									
-Major teaching	75	552	213,845	2.6	0.4	1.2	2.1	3.5	5.1
Surgical									
-All other	103 (102)	366	185,967	2.0	0.0	0.1	1.3	2.5	4.4
Surgical cardiothoracic	216 (213)	560	356,842	1.6	0.0	0.0	1.0	2.2	3.4
Trauma	75	776	230,687	3.4	0.2	1.3	2.5	4.1	6.0
Specialty Care Areas/Oncology									
Hematopoietic stem cell transplant	31 (29)	28	15,218	1.8	0.0	0.0	0.0	2.8	4.6
General hematology/oncology	93 (91)	162	76,670	2.1	0.0	0.5	1.9	3.1	4.7
Pediatric general hematology/oncology	10 (7)	4	1,213	3.3					
Solid organ transplant	10	21	12,370	1.7					
Step-Down Units									
Adult step-down (post-critical care)	318 (313)	764	439,142	1.7	0.0	0.0	1.3	2.7	4.5
Pediatric step-down (post-critical care)	7 (5)	3	709	4.2					
Inpatient Wards									
Acute stroke	11	23	13,825	1.7					
Antenatal	7	0	971	0.0					
Behavioral health/psychiatry	91 (31)	19	7,517	2.5	0.0	0.0	0.0	0.2	8.1
Burn	10 (9)	11	2,278	4.8					
Genitourinary	7	16	8,166	2.0					
Gerontology	9 (8)	11	6,052	1.8					
Gynecology	41 (36)	17	25,605	0.7	0.0	0.0	0.0	0.0	2.2
Jail	7 (4)	4	2,344	1.7					
Labor and delivery	53 (39)	5	22,350	0.2	0.0	0.0	0.0	0.0	0.1
Labor, delivery, recovery, postpartum suite	118 (100)	16	37,717	0.4	0.0	0.0	0.0	0.0	0.0
Medical	577 (566)	979	646,918	1.5	0.0	0.0	1.0	2.4	3.9
Medical/Surgical	1,345 (1,292)	1,979	1,484,664	1.3	0.0	0.0	0.8	2.0	3.5
Neurologic	34	95	44,538	2.1	0.0	0.5	1.5	3.8	5.2
Neurosurgical	35	126	51,830	2.4	0.0	0.5	1.5	3.8	6.1
Orthopedic	169 (166)	308	233,542	1.3	0.0	0.0	0.8	2.0	3.8
Orthopedic trauma	10	32	17,818	1.8					
Pediatric medical/surgical	141 (73)	38	27,035	1.4	0.0	0.0	0.0	2.0	5.1

Pediatric medical	27 (11)	6	3,703	1.6					
Pediatric surgical	7 (6)	9	6,293	1.4					
Postpartum	140 (133)	32	68,027	0.5	0.0	0.0	0.0	0.0	1.7
Pulmonary	22	67	34,677	1.9	0.0	0.3	1.1	3.0	3.8
Rehabilitation - non-IRF	43 (40)	45	14,210	3.2	0.0	0.0	0.0	4.3	10.1
Surgical	313 (308)	660	437,413	1.5	0.0	0.0	1.0	2.2	4.3
Telemetry	90 (88)	132	114,507	1.2	0.0	0.0	0.8	1.9	3.8
Vascular surgery	10	15	10,396	1.4					
Well-baby nursery	8 (1)	0	126	0.0					
Inpatient Long Term Care⁵									
Chronic care	16 (5)	12	7,945	1.5					
Long-term care rehabilitation unit	8	18	2,550	7.1					
Long-Term Acute Care Hospitals[‡]									
Adult critical care	6	17	4,777	3.6					
Adult Ward	166 (165)	1,407	652,175	2.2	0.0	0.9	1.8	3.1	4.8
Inpatient Rehabilitation Facilities[¶]									
Adult rehabilitation units - Freestanding	82 (81)	164	54,732	3.0	0.0	0.0	1.4	3.9	6.5
Adult rehabilitation units - Within hospital	138 (126)	147	47,869	3.1	0.0	0.0	1.1	5.2	9.0

Urinary catheter utilization ratio**					Percentile				
Type of Location	No. of locations+	Urinary catheter-days	Patient days	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals									
Critical Care Units									
Burn	38	36,222	72,139	0.50	0.34	0.38	0.45	0.64	0.76
Medical -Major teaching	99	287,880	410,123	0.70	0.56	0.65	0.74	0.80	0.85
Medical -All other	212 (210)	350,509	570,682	0.61	0.33	0.53	0.68	0.78	0.85
Medical cardiac	211 (210)	301,884	597,741	0.51	0.25	0.38	0.53	0.66	0.74
Medical/surgical -Major teaching	146 (145)	381,416	551,855	0.69	0.49	0.62	0.74	0.80	0.83
Medical/surgical -All other ≤15 beds	793 (766)	750,795	1,399,138	0.54	0.31	0.46	0.61	0.73	0.81
Medical/surgical -All other > 15 beds	405	1,181,301	1,776,793	0.66	0.49	0.60	0.71	0.78	0.84
Neurologic	21	34,422	48,549	0.71	0.32	0.56	0.73	0.82	0.84
Neurosurgical	74	181,986	261,682	0.70	0.54	0.61	0.71	0.79	0.85
Pediatric cardiothoracic	10	8,764	45,281	0.19					
Pediatric medical	11	1,736	14,045	0.12					
Pediatric medical/surgical	129 (126)	70,607	311,974	0.23	0.07	0.12	0.20	0.26	0.32
Prenatal	6	781	7,926	0.10					
Respiratory	6	7,869	17,388	0.45					
Surgical -Major teaching	75	213,845	282,221	0.76	0.58	0.70	0.77	0.83	0.88
Surgical -All other	103 (102)	185,967	261,357	0.71	0.45	0.64	0.75	0.81	0.89
Surgical cardiothoracic	216 (215)	356,842	530,154	0.67	0.41	0.55	0.69	0.82	0.88
Trauma	75	230,687	292,809	0.79	0.62	0.74	0.80	0.87	0.94
Specialty Care Areas/Oncology									
Hematopoietic stem cell transplant	31	15,218	135,776	0.11	0.04	0.05	0.07	0.15	0.24
General hematology/oncology	93 (92)	76,670	492,732	0.16	0.07	0.09	0.15	0.21	0.30
Pediatric general hematology/oncology	10	1,213	49,541	0.02					
Solid organ transplant	10	12,370	61,782	0.20					
Step-Down Units									
Adult step-down (post-critical care)	318	439,142	1,708,256	0.26	0.12	0.17	0.25	0.37	0.52
Pediatric step-down (post-critical care)	7	709	21,427	0.03					

Inpatient Wards									
Acute stroke	11	13,825	40,059	0.35					
Antenatal	7	971	9,257	0.10					
Behavioral health/psychiatry	91	7,517	216,343	0.03	0.00	0.01	0.02	0.04	0.07
Burn	10	2,278	15,692	0.15					
Genitourinary	7	8,166	48,061	0.17					
Gerontology	9	6,052	48,732	0.12					
Gynecology	41	25,605	124,166	0.21	0.07	0.12	0.20	0.29	0.47
Jail	7	2,344	24,249	0.10					
Labor and delivery	53	22,350	101,221	0.22	0.02	0.06	0.13	0.20	0.44
Labor, delivery, recovery, postpartum suite	118 (116)	37,717	243,461	0.15	0.06	0.10	0.13	0.19	0.28
Medical	577 (574)	646,918	3,758,665	0.17	0.08	0.12	0.17	0.22	0.30
Medical/Surgical	1,345 (1,335)	1,484,664	7,712,951	0.19	0.10	0.13	0.18	0.24	0.31
Neurologic	34	44,538	213,695	0.21	0.09	0.15	0.20	0.24	0.36
Neurosurgical	35	51,830	229,333	0.23	0.10	0.17	0.21	0.32	0.50
Orthopedic	169	233,542	869,225	0.27	0.13	0.20	0.27	0.34	0.44
Orthopedic trauma	10	17,818	76,451	0.23					
Pediatric medical/surgical	141 (138)	27,035	382,338	0.07	0.01	0.01	0.04	0.08	0.15
Pediatric medical	27 (26)	3,703	81,712	0.05	0.01	0.01	0.01	0.03	0.16
Pediatric surgical	7	6,293	39,998	0.16					
Postpartum	140	68,027	519,219	0.13	0.03	0.08	0.13	0.19	0.29
Pulmonary	22	34,677	154,604	0.22	0.09	0.16	0.19	0.23	0.50
Rehabilitation - non-IRF	43	14,210	166,012	0.09	0.03	0.05	0.07	0.13	0.16
Surgical	313 (311)	437,413	1,875,890	0.23	0.12	0.17	0.23	0.30	0.40
Telemetry	90 (89)	114,507	548,651	0.21	0.10	0.15	0.21	0.25	0.31
Vascular surgery	10	10,396	65,192	0.16					
Well-baby nursery	8 (7)	126	2,149	0.06					
Inpatient Long Term Care [§]									
Chronic care	16 (13)	7,945	41,541	0.19					
Long-term care rehabilitation unit	8	2,550	38,741	0.07					
Long-Term Acute Care Hospitals [‡]									
Adult critical care	6	4,777	11,806	0.40					
Adult Ward	166	652,175	1,258,801	0.52	0.31	0.43	0.51	0.62	0.71
Inpatient Rehabilitation Facilities [¶]									
Adult rehabilitation units - Freestanding	82	54,732	700,414	0.08	0.03	0.05	0.07	0.09	0.13
Adult rehabilitation units - Within hospital	138	47,869	521,238	0.09	0.03	0.05	0.08	0.12	0.16

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.

|| Includes only in-hospital rehabilitation wards that are not defined as inpatient rehabilitation facilities (IRF) per the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

¶ Includes free-standing inpatient rehabilitation facilities and inpatient rehabilitation facilities within the acute care hospital setting, as defined by the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

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, 2011

Ventilator-associated PNEU rate*					Percentile				
Type of location	No. of locations +	No. of VAP	Ventilator -days	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals									
Critical Care Units									
Burn	31 (30)	88	17,844	4.9	0.0	0.0	4.2	8.8	12.5
Medical -Major teaching	89	188	174,412	1.1	0.0	0.0	0.7	1.8	3.0
Medical -All other	156 (141)	152	156,191	1.0	0.0	0.0	0.0	1.0	3.0
Medical cardiac	161 (152)	138	128,369	1.1	0.0	0.0	0.0	1.3	3.8
Medical/surgical -Major teaching	123 (118)	461	215,214	2.1	0.0	0.0	1.0	2.3	5.4
Medical/surgical -All other ≤15 beds	597 (482)	296	267,272	1.1	0.0	0.0	0.0	1.2	4.3
Medical/surgical -All other >15 beds	317 (315)	527	509,492	1.0	0.0	0.0	0.6	1.6	2.8
Neurologic	19	64	17,656	3.6					
Neurosurgical	66 (65)	161	70,894	2.3	0.0	0.0	0.7	3.0	5.9
Pediatric cardiothoracic	15	12	28,756	0.4					
Pediatric medical	11	6	7,385	0.8					
Pediatric medical/surgical	121 (112)	146	135,585	1.1	0.0	0.0	0.0	1.4	3.2
Respiratory	6	0	3,984	0.0					
Surgical -Major teaching	70	290	122,472	2.4	0.0	0.6	1.7	3.5	6.4
Surgical -All other	83 (81)	165	82,363	2.0	0.0	0.0	0.1	2.8	4.7
Surgical cardiothoracic	168 (164)	268	154,234	1.7	0.0	0.0	0.6	2.4	5.3
Trauma	56	499	106,857	4.7	0.0	0.9	3.1	7.5	13.5
Specialty Care Areas/Oncology									
Hematopoietic stem cell transplant	5 (4)	0	1,118	0.0					
Step-Down Units									
Adult step-down (post-critical care)	73 (59)	41	38,572	1.1	0.0	0.0	0.0	1.0	3.7
Step-down NICU (level II)	6 (0)	0	93	0.0					
Inpatient Wards									
Medical	34 (21)	1	8,316	0.1	0.0	0.0	0.0	0.0	0.0
Medical/surgical	53 (32)	17	23,349	0.7	0.0	0.0	0.0	0.7	2.3
Neurosurgical	5	1	3,178	0.3					
Pediatric medical	6 (5)	0	2,707	0.0					
Pediatric medical/surgical	10 (8)	0	2,609	0.0					
Pulmonary	7(5)	6	5,840	1.0					
Telemetry	5 (3)	1	1,245	0.8					
Long-Term Acute Care Hospitals[‡]									
Adult critical care	6	2	4,314	0.5					
Adult ward	144 (139)	114	249,330	0.5	0.0	0.0	0.0	0.6	1.2

Ventilator utilization ratio**					Percentile				
Type of location	No. of locations +	Ventilator -days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals									
Critical Care Units									
Burn	31	17,844	66,570	0.27	0.10	0.16	0.24	0.30	0.42
Medical -Major teaching	89	174,412	381,557	0.46	0.29	0.38	0.47	0.57	0.65
Medical -All other	156 (153)	156,191	444,893	0.35	0.09	0.19	0.32	0.47	0.56
Medical cardiac	161 (160)	128,369	461,148	0.28	0.10	0.17	0.25	0.35	0.43
Medical/surgical -Major teaching	123 (122)	215,214	522,459	0.41	0.16	0.26	0.39	0.49	0.59
Medical/surgical -All other ≤15 beds	597 (582)	267,272	1,118,363	0.24	0.05	0.11	0.21	0.32	0.44
Medical/surgical -All other >15 beds	317 (316)	509,492	1,473,581	0.35	0.18	0.26	0.35	0.44	0.51
Neurologic	19	17,656	48,822	0.36					
Neurosurgical	66	70,894	236,554	0.30	0.14	0.24	0.29	0.38	0.45
Pediatric cardiothoracic	15	28,756	64,406	0.45					
Pediatric medical	11	7,385	22,346	0.33					
Pediatric medical/surgical	121	135,585	339,407	0.40	0.13	0.20	0.34	0.44	0.52
Respiratory	6	3,984	11,366	0.35					
Surgical -Major teaching	70	122,472	292,517	0.42	0.20	0.30	0.40	0.50	0.57
Surgical -All other	83 (82)	82,363	238,048	0.35	0.15	0.23	0.31	0.45	0.52
Surgical cardiothoracic	168	154,234	462,733	0.33	0.16	0.22	0.31	0.41	0.51
Trauma	56	106,857	225,654	0.47	0.36	0.42	0.48	0.55	0.64
Specialty Care Areas/Oncology									
Hematopoietic stem cell transplant	5	1,118	19,480	0.06					
Step-Down Units									
Adult step-down (post-critical care)	73	38,572	346,418	0.11	0.01	0.03	0.08	0.13	0.31
Step-down NICU (level II)	6	93	4,706	0.02					
Inpatient Wards									
Medical	34	8,316	168,127	0.05	0.00	0.01	0.02	0.04	0.07
Medical/surgical	53	23,349	319,638	0.07	0.00	0.01	0.03	0.07	0.19
Neurosurgical	5	3,178	28,557	0.11					
Pediatric medical	6	2,707	30,620	0.09					
Pediatric medical/surgical	10	2,609	52,868	0.05					
Pulmonary	7	5,840	35,269	0.17					
Telemetry	5	1,245	20,685	0.06					
Long-Term Acute Care Hospitals†									
Adult critical care	6	4,314	11,806	0.37					
Adult ward	144	249,330	1,129,832	0.22	0.07	0.12	0.20	0.29	0.40

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, 2011

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	385 (342)	500	196,659	2.5	0.0	0.0	1.6	4.3	7.8
751-1000 grams	405 (351)	339	168,938	2.0	0.0	0.0	0.3	3.2	6.3
1001-1500 grams	412 (368)	244	186,099	1.3	0.0	0.0	0.0	1.9	4.5
1501-2500 grams	408 (348)	150	163,339	0.9	0.0	0.0	0.0	0.7	2.7
> 2500 grams	413 (331)	154	181,091	0.9	0.0	0.0	0.0	0.3	2.1

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	385 (351)	196,659	452,309	0.43	0.29	0.37	0.45	0.57	0.72
751-1000 grams	405 (370)	168,938	456,349	0.37	0.23	0.30	0.38	0.47	0.65
1001-1500 grams	412 (405)	186,099	654,187	0.28	0.14	0.20	0.27	0.38	0.52
1501-2500 grams	408 (405)	163,339	885,095	0.18	0.05	0.08	0.14	0.22	0.43
> 2500 grams	413 (406)	181,091	713,246	0.25	0.06	0.10	0.17	0.30	0.45

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, 2011

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	364 (265)	295	110,172	2.7	0.0	0.0	0.0	4.4	8.6
751-1000 grams	412 (296)	193	101,645	1.9	0.0	0.0	0.0	3.2	6.9
1001-1500 grams	486 (363)	147	126,819	1.2	0.0	0.0	0.0	1.5	4.4
1501-2500 grams	520 (355)	87	117,530	0.7	0.0	0.0	0.0	0.0	2.3
> 2500 grams	525 (315)	77	109,730	0.7	0.0	0.0	0.0	0.0	1.9

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	364 (288)	110,172	266,479	0.41	0.28	0.35	0.48	0.63	0.78
751-1000 grams	412 (335)	101,645	264,904	0.38	0.22	0.30	0.39	0.51	0.65
1001-1500 grams	486 (438)	126,819	460,014	0.28	0.12	0.18	0.27	0.37	0.51
1501-2500 grams	520 (495)	117,530	740,279	0.16	0.04	0.07	0.12	0.19	0.32
> 2500 grams	525 (494)	109,730	555,599	0.20	0.05	0.08	0.12	0.22	0.32

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, 2011

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	127 (112)	89	57,133	1.6	0.0	0.0	0.0	2.2	6.9
751-1000 grams	125 (104)	47	32,501	1.4	0.0	0.0	0.0	0.9	4.4
1001-1500 grams	130 (88)	20	19,974	1.0	0.0	0.0	0.0	0.0	2.9
1501-2500 grams	129 (69)	9	17,250	0.5	0.0	0.0	0.0	0.0	0.1
> 2500 grams	128 (72)	6	29,102	0.2	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	127 (118)	57,133	147,932	0.39	0.22	0.30	0.43	0.55	0.66
751-1000 grams	125 (118)	32,501	145,520	0.22	0.07	0.13	0.22	0.34	0.48
1001-1500 grams	130 (127)	19,974	185,367	0.11	0.02	0.05	0.08	0.16	0.28
1501-2500 grams	129 (128)	17,250	253,259	0.07	0.01	0.02	0.04	0.09	0.19
> 2500 grams	128	29,102	230,077	0.13	0.02	0.03	0.07	0.14	0.23

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, 2011

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	99 (69)	49	27,190	1.8	0.0	0.0	0.0	2.8	5.9
751-1000 grams	105 (66)	21	14,685	1.4	0.0	0.0	0.0	0.0	9.7
1001-1500 grams	118 (52)	7	8,464	0.8	0.0	0.0	0.0	0.0	1.5
1501-2500 grams	131 (43)	7	8,590	0.8	0.0	0.0	0.0	0.0	3.8
> 2500 grams	136 (44)	2	10,737	0.2	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	99 (80)	27,190	73,463	0.37	0.21	0.27	0.39	0.53	0.65
751-1000 grams	105 (87)	14,685	67,793	0.22	0.09	0.14	0.22	0.33	0.45
1001-1500 grams	118 (101)	8,464	102,660	0.08	0.02	0.04	0.07	0.12	0.20
1501-2500 grams	131 (127)	8,590	167,465	0.05	0.01	0.02	0.03	0.05	0.11
> 2500 grams	136 (125)	10,737	123,770	0.09	0.02	0.03	0.04	0.08	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, 2011

Type of Location	LBCI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
Acute Care Hospitals					
Critical Care					
Burn	281	93.4%	20	6.6%	301
Medical -Major teaching	605	86.1%	98	13.9%	703
Medical -All other	620	80.6%	149	19.4%	769
Medical cardiac	542	80.5%	131	19.5%	673
Medical/surgical -Major teaching	783	83.6%	154	16.4%	937
Medical/surgical -All other ≤15 beds	1,003	80.5%	243	19.5%	1,246
Medical/surgical -All other > 15 beds	1,540	78.6%	419	21.4%	1,959
Neurologic	55	72.4%	21	27.6%	76
Neurosurgical	220	71.2%	89	28.8%	309
Pediatric cardiothoracic	143	79.4%	37	20.6%	180
Pediatric medical	32	94.1%	2	5.9%	34
Pediatric medical/surgical	567	79.1%	150	20.9%	717
Pediatric surgical	3	100.0%	0	0.0%	3
Respiratory	8	100.0%	0	0.0%	8
Surgical -Major teaching	406	79.0%	108	21.0%	514
Surgical -All other	360	83.9%	69	16.1%	429
Surgical cardiothoracic	641	84.1%	121	15.9%	762
Trauma	437	85.5%	74	14.5%	511
Step-Down Units					
Adult step-down (post-critical care)	486	82.7%	102	17.3%	588
Step-down NICU (level II)	4	50.0%	4	50.0%	8
Pediatric step-down (post-critical care)	17	89.5%	2	10.5%	19
Inpatient Wards					
Acute stroke	8	80.0%	2	20.0%	10
Antenatal	0	0.0%	1	100.0%	1
Behavioral health/psychiatry	4	100.0%	0	0.0%	4
Burn	5	100.0%	0	0.0%	5
Genitourinary	14	73.7%	5	26.3%	19
Geronotology	7	100.0%	0	0.0%	7
Gynecology	6	85.7%	1	14.3%	7
Jail	10	90.9%	1	9.1%	11
Labor, delivery, recovery, postpartum suite	1	100.0%	0	0.0%	1
Medical	764	84.1%	144	15.9%	908
Medical/surgical	1,347	83.9%	259	16.1%	1,606
Neurologic	38	86.4%	6	13.6%	44
Neurosurgical	37	78.7%	10	21.3%	47
Orthopedic	72	73.5%	26	26.5%	98
Orthopedic trauma	27	84.4%	5	15.6%	32
Pediatric medical	54	87.1%	8	12.9%	62
Pediatric medical/surgical	160	81.2%	37	18.8%	197
Pediatric rehabilitation - non-IRF ^{II}	7	100.0%			7
Pediatric surgical	20	95.2%	1	4.8%	21
Postpartum	1	100.0%	0	0.0%	1
Pulmonary	45	86.5%	7	13.5%	52

Rehabilitation - non-IRF	9	90.0%	1	10.0%	10
Surgical	335	81.7%	75	18.3%	410
Telemetry	163	86.7%	25	13.3%	188
Vascular Surgery	13	92.9%	1	7.1%	14
Well-Baby Nursery	1	50.0%	1	50.0%	2
Inpatient Long Term Care[§]					
Chronic care	5	100.0%	0	0.0%	5
Ventilator dependent unit	16	84.2%	3	15.8%	19
Long-Term Acute Care Hospitals[‡]					
Adult critical care	68	89.5%	8	10.5%	76
Adult Ward	1,204	84.1%	227	15.9%	1,431
Inpatient Rehabilitation Facilities[¶]					
Adult rehabilitation units - Freestanding	21	91.3%	2	8.7%	23
Adult rehabilitation units - Within hospital	38	88.4%	5	11.6%	43
Total	13,253	82.5%	2,854	17.8%	16,064

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.

|| Includes only in-hospital rehabilitation wards that are not defined as inpatient rehabilitation facilities (IRF) per the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

¶ Includes free-standing inpatient rehabilitation facilities and inpatient rehabilitation facilities within the acute care hospital setting, as defined by the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

Table 12. Distribution of criteria for permanent and temporary central line-associated laboratory-confirmed BSI by location, 2011

Type of location	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
Permanent Central Line					
Hematopoietic stem cell transplant	219	76.8%	66	23.2%	285
General hematology/oncology	307	76.8%	93	23.3%	400
Pediatric hematopoietic stem cell transplant	55	82.1%	12	17.9%	67
Pediatric general hematology/oncology	175	82.5%	37	17.5%	212
Solid organ transplant	24	88.9%	3	11.1%	27
Total	780	78.7%	211	21.3%	991
Temporary Central Line					
Hematopoietic stem cell transplant	164	80.4%	40	19.6%	204
General hematology/oncology	387	81.5%	88	18.5%	475
Pediatric hematopoietic stem cell transplant	9	81.8%	2	18.2%	11
Pediatric general hematology/oncology	69	82.1%	15	17.9%	84
Solid organ transplant	47	81.0%	11	19.0%	58
Total	676	81.3%	156	18.8%	832

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

Table 13. Distribution of specific sites of urinary catheter-associated UTI by location, 2011

Type of Location	SUTI	n (%)	ABUTI	n (%)	Total
Acute Care Hospitals					
Critical Care					
Burn	147	99.3%	1	0.7%	148
Medical -Major teaching	728	98.5%	11	1.5%	739
Medical -All other	541	98.0%	11	2.0%	552
Medical cardiac	588	98.7%	8	1.3%	596
Medical/surgical -Major teaching	816	98.7%	11	1.3%	827
Medical/surgical -All other ≤15 beds	901	97.8%	20	2.2%	921
Medical/surgical -All other > 15 beds	1,652	98.0%	33	2.0%	1,685
Neurologic	115	99.1%	1	0.9%	116
Neurosurgical	810	99.8%	2	0.2%	812
Pediatric cardiothoracic	12	100.0%			12
Pediatric medical	5	100.0%			5
Pediatric medical/surgical	212	97.7%	5	2.3%	217
Pediatric	1	100.0%			1
Respiratory	11	100.0%			11
Surgical -Major teaching	548	99.3%	4	0.7%	552
Surgical -All other	356	97.3%	10	2.7%	366
Surgical cardiothoracic	551	98.4%	9	1.6%	560
Trauma	771	99.4%	5	0.6%	776
Specialty Care Areas/Oncology					
Hematopoietic stem cell transplant	28	100.0%			28
General hematology/oncology	159	98.1%	3	1.9%	162
Pediatric general hematology/oncology	4	100.0%			4
Solid organ transplant	21	100.0%			21
Step-Down Units					
Adult step-down (post-critical care)	749	98.0%	15	2.0%	764
Pediatric step-down (post-critical care)	3	100.0%			3
Inpatient Wards					
Acute stroke	22	95.7%	1	4.3%	23
Behavioral health/psychiatry	19	100.0%			19
Burn	11	100.0%			11
Genitourinary	16	100.0%			16
Geronotology	11	100.0%			11
Gynecology	17	100.0%			17
Jail	4	100.0%			4
Labor and delivery	5	100.0%			5
Labor, delivery, recovery, postpartum suite	15	93.8%	1	6.3%	16
Medical	961	98.2%	18	1.8%	979
Medical/surgical	1,959	99.0%	20	1.0%	1,979
Neurologic	95	100.0%			95
Neurosurgical	126	100.0%			126
Orthopedic	306	99.4%	2	0.6%	308
Orthopedic trauma	32	100.0%			32
Pediatric medical/surgical	38	100.0%			38
Pediatric medical	6	100.0%			6
Pediatric surgical	9	100.0%			9
Postpartum	32	100.0%			32
Pulmonary	64	95.5%	3	4.5%	67

Rehabilitation - non-IRF ^{II}	44	97.8%	1	2.2%	45
Surgical	654	99.1%	6	0.9%	660
Telemetry	131	99.2%	1	0.8%	132
Vascular Surgery	15	100.0%			15
Inpatient Long Term Care[§]					
Chronic care	12	100.0%			12
Long-term care rehabilitation unit	18	100.0%			18
Long-Term Acute Care Hospitals[‡]					
Adult critical care	17	100.0%			17
Adult Ward	1,391	98.9%	15	1.1%	1,406
Inpatient Rehabilitation Facilities[¶]					
Adult rehabilitation units - Freestanding	164	100.0%			164
Adult rehabilitation units - Within hospital	143	97.3%	4	2.7%	147
Total	16,066	98.7%	217	1.3%	16,283

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.

II Includes only in-hospital rehabilitation wards that are not defined as inpatient rehabilitation facilities (IRF) per the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

¶ Includes free-standing inpatient rehabilitation facilities and inpatient rehabilitation facilities within the acute care hospital setting, as defined by the CMS Inpatient Rehabilitation Facility Quality Reporting Program.

Table 14. Distribution of specific sites of ventilator-associated pneumonia by location, 2011

Type of location	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
Acute Care Hospitals							
Critical Care Units							
Burn	37	42.0%	51	58.0%			88
Medical -Major teaching	117	62.2%	68	36.2%	3	1.6%	188
Medical -All other	124	81.6%	28	18.4%			152
Medical cardiac	76	55.1%	62	44.9%			138
Medical/surgical -Major teaching	213	46.2%	245	53.1%	3	0.7%	461
Medical/surgical -All other ≤15 beds	214	72.3%	75	25.3%	7	2.4%	296
Medical/surgical -All other >15 beds	309	58.6%	204	38.7%	14	2.7%	527
Neurologic	19	29.7%	45	70.3%			64
Neurosurgical	79	49.1%	81	50.3%	1	0.6%	161
Pediatric cardiothoracic	9	75.0%	3	25.0%			12
Pediatric medical	6	100.0%					6
Pediatric medical/surgical	111	76.0%	34	23.3%	1	0.7%	146
Surgical -Major teaching	142	49.0%	138	47.6%	10	3.4%	290
Surgical -All other	80	48.5%	82	49.7%	3	1.8%	165
Surgical cardiothoracic	154	57.5%	107	39.9%	7	2.6%	268
Trauma	244	48.9%	251	50.3%	4	0.8%	499
Step-Down Units							
Adult step-down (post-critical care)	35	85.4%	6	14.6%			41
Inpatient Wards							
Medical	1	100.0%					1
Medical/surgical	5	29.4%	12	70.6%			17
Neurosurgical	1	100.0%					1
Pulmonary			6	100.0%			6
Telemetry	1	100.0%					1
Long Term Acute Care*							
Adult critical care	1	50.0%			1	50.0%	2
Adult ward	82	71.9%	32	28.1%			114
Total	2,060	56.5%	1,530	42.0%	54	1.5%	3,644

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, 2011

Birth-weight category	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
≤ 750 grams	346	69.2%	154	30.8%	500
751-1000 grams	216	63.7%	123	36.3%	339
1001-1500 grams	156	63.9%	88	36.1%	244
1501-2500 grams	106	70.7%	44	29.3%	150
> 2500 grams	118	76.6%	36	23.4%	154
Total	942	67.9%	445	32.1%	1387

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, 2011

Birth-weight category	LCBI				Total
	Criterion 1	n (%)	Criterion 2/3	n (%)	
≤ 750 grams	194	65.8%	101	34.2%	295
751-1000 grams	119	61.7%	74	38.3%	193
1001-1500 grams	86	58.5%	61	41.5%	147
1501-2500 grams	55	63.2%	32	36.8%	87
> 2500 grams	50	64.9%	27	35.1%	77
Total	504	63.1%	295	36.9%	799

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

Table 17. Distribution of specific sites of ventilator-associated pneumonia among Level III NICUs by birthweight, 2011

Birth-weight category	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
≤ 750 grams	62	69.7%	26	29.2%	1	1.1%	89
751-1000 grams	29	61.7%	17	36.2%	1	2.1%	47
1001-1500 grams	15	75.0%	5	25.0%			20
1501-2500 grams	6	66.7%	3	33.3%			9
> 2500 grams	6	100.0%					6
Total	118	69.0%	51	29.8%	2	1.2%	171

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, 2011

Birth-weight category	PNU1	n (%)	PNU2	n (%)	PNU3	n (%)	Total
≤ 750 grams	37	75.5%	7	14.3%	5	10.2%	49
751-1000 grams	14	66.7%	5	23.8%	2	9.5%	21
1001-1500 grams	6	85.7%	1	14.3%			7
1501-2500 grams	7	100.0%					7
> 2500 grams	2	100.0%					2
Total	66	76.7%	13	15.1%	7	8.1%	86

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,
 $\text{DU} = 28/72 = 0.39$ 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.

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