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National Healthcare Safety Network (NHSN) report: Data summary for 2006 through 2008, issued December 2009

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This report is a summary of Device-Associated (DA) and Procedure-Associated (PA) module data collected and reported by hospitals and ambulatory surgical centers participating in the National Healthcare Safety Network (NHSN) from January 2006 through December 2008 as reported to the Centers for Disease Control and Prevention (CDC) by July 6, 2009. This report updates previously published DA and PA module data from the NHSN.[1]

The NHSN was established in 2005 to integrate and supersede 3 legacy surveillance systems at the CDC: the National Nosocomial Infections Surveillance (NNIS) system, the Dialysis Surveillance Network (DSN), and the National Surveillance System for Healthcare Workers (NaSH). Similar to the NNIS system, NHSN facilities voluntarily report their health care–associated infection (HAI) surveillance data for aggregation into a single national database for the following purposes:

- Estimation of the magnitude of HAIs
- Monitoring of HAI trends
- Facilitation of interfacility and intrafacility comparisons with risk-adjusted data that can be used for local quality improvement activities
- Assistance to facilities in developing surveillance and analysis methods that permit timely recognition of patient safety problems and prompt intervention with appropriate measures.

In addition, many facilities use these same data to comply with state reporting mandates. Identity of all NHSN facilities is kept confidential by the CDC in accordance with Sections 304, 306, and 308(d) of the Public Health Service Act [42 USC 242b, 242k, and 242m(d)].

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METHODS

NHSN data collection, reporting, and analysis are organized into 4 components: Patient Safety, Healthcare Personnel Safety, Biovigilance, and Research and Development. Data for the Patient Safety Component are collected using standardized methods and definitions[2,3] and in accordance with specific module protocols.[4] The modules may be used singly or simultaneously, but once selected, they must be used for a minimum of 1 calendar month. All infections are categorized using standard CDC definitions that include laboratory and clinical criteria.[3] The DA module may be used by facilities other than hospitals, including long-term care facilities and outpatient dialysis centers. A report of data from this module for outpatient dialysis centers was published separately.[5]

Device-Associated module

Infection preventionists (IPs) may choose to collect data on central line-associated primary bloodstream

Table 1. NHSN hospitals contributing data used in this report

Hospital type	N	(%)
Children's	38	(2.5)
General, including acute, trauma, and teaching	1389	(89.9)
Long-term acute care	27	(1.7)
Military	9	(0.6)
Oncology	8	(0.5)
Orthopedic	8	(0.5)
Psychiatric	8	(0.5)
Rehabilitation	17	(1.1)
Surgical	1	(0.1)
Veterans Affairs	31	(2.0)
Women's	4	(0.3)
Women's and children's	5	(0.3)
Total	1545	(100)

infections (BSIs), ventilator-associated pneumonias, or urinary catheter-associated urinary tract infections (UTIs) that occur in patients staying in a patient care location such as a critical care or intensive care unit (ICU), specialty care area (SCA), or ward. In NHSN, these locations are further characterized according to patient population: adults, children, or infants (in tables, pediatric and nursery locations are so noted). In neonatal intensive care unit (NICU) locations (level III or level II/III), IPs collect data on central line-associated and umbilical catheter–associated primary bloodstream infections or ventilator-associated pneumonia for each of 5 birth-weight categories (≤750 g, 751-1000 g, 1001-1500 g, 1501-2500 g, and >2500 g). Corresponding location-specific denominator data consisting of patient-days and specific device-days are also collected by IPs or other trained personnel.

Twenty-one new locations—pediatric cardiothoracic ICU, respiratory ICU, behavioral health ward, genitourinary ward, gerontology ward, gynecology ward, labor and delivery ward, labor, delivery, recovery, postpartum ward, neurology ward, neurosurgical ward, orthopedic ward, pediatric medical/surgical ward, pediatric medical ward, postpartum ward, vascular surgery ward, level I nursery, level II nursery, long-term care unit, long-term acute care SCA, solid organ transplant SCA and pediatric hematology/oncology SCA—had sufficient data to be included in this report. Among these new locations only pediatric medical/surgical ward comprised sufficient data to provide key percentiles of the distributions of central line-associated bloodstream and catheter-associated UTI rate and DU ratios.

The data for adult combined medical/surgical ICUs were split into two groups by type of hospital: ''major teaching'' and ''all others.'' Major teaching status was defined as a hospital that is an important part of the teaching program of a medical school and the majority of medical students rotate through multiple clinical services. The ''all others'' group of adult combined medical/surgical ICUs were further split into 2 groups by unit bed size: ≤15 beds and >15 beds. In addition, the data for adult medical ICUs were split into 2 groups by type of hospital as defined above.

In non-NICU locations, the device-days consisted of the total number of central line-days, urinary catheter-days, or ventilator-days. The DU of a location is one measure of invasive practices in that location and constitutes an extrinsic risk factor for health care-associated infection.[6] DU also may serve as a marker for severity of illness of patients, that is, patients' intrinsic susceptibility to infection.

Procedure-Associated module

IPs select from the NHSN operative procedure category list those inpatient and/or outpatient procedures for which they decide to monitor surgical patients for SSIs or postprocedure pneumonias (PPPs). During the month chosen for surveillance, data are collected on every patient undergoing procedures within the selected procedure category, including information on risk factors for SSI such as duration of procedure in minutes,

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

	Bed size category								
	≤200		201-500		501-1000		>1000		
Hospital type	N	(%)	N	(%)	N	(%)	N	(%)	Total
Major teaching	83	(5.4)	110	(7.1)	73	(4.7)	3	(0.2)	269 (17.4)
Graduate teaching	73	(4.7)	60	(3.8)	22	(1.4)	0	(0.0)	155 (10.0)
Limited teaching	96	(6.2)	59	(3.8)	7	(0.5)	0	(0.0)	162 (10.5)
Nonteaching	730	(47.2)	211	(13.7)	17	(1.1)	1	(0.1)	959 (62.1)
Total	982	(63.6)	440	(28.5)	119	(7.6)	4	(0.3)	1545 (100)

NOTE. 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 (ie, residency and/or fellowships). Limited: Hospital is used in the medical school's teaching program to only 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, 2006 through 2008

Central line–associated BSI rate[†]

Type of location	No. of locations*	No. of CLABSI	Central line-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	35	390	70,932	5.5	0.0	1.2	3.1	7.5	11.8
Medical cardiac	228 (221)	876	436,409	2.0	0.0	0.0	1.3	2.5	4.6
Medical major teaching	125	1410	549,088	2.6	0.1	1.1	2.3	3.7	5.2
Medical all others	153 (147)	687	362,388	1.9	0.0	0.0	1.0	2.4	4.3
Medical/surgical major teaching	182 (181)	1474	699,300	2.1	0.0	0.6	1.7	2.9	4.6
Medical/surgical all others ≤15 beds	718 (650)	1130	755,437	1.5	0.0	0.0	0.0	1.8	3.7
Medical/surgical all others >15 beds	280 (277)	1449	986,982	1.5	0.0	0.0	1.1	2.0	3.6
Neurologic	24 (23)	61	45,153	1.4	0.0	0.0	1.0	1.9	3.2
Neurosurgical	72	396	160,879	2.5	0.0	0.0	1.9	3.2	5.3
Pediatric cardiothoracic	18	195	58,626	3.3					
Pediatric medical	16 (15)	23	17,321	1.3					
Pediatric medical/surgical	129 (123)	929[‡]	314,306	3.0	0.0	1.1	2.5	4.3	5.8
Respiratory	8	29	17,223	1.7					
Surgical	208 (207)	1683	729,989	2.3	0.0	0.7	1.7	3.1	5.0
Surgical cardiothoracic	203 (202)	879	632,769	1.4	0.0	0.2	0.8	1.9	3.3
Trauma	62	814	224,864	3.6	0.0	1.4	3.0	5.5	9.3
Inpatient wards									
Adult step-down unit (postcritical care)	145 (136)	299	141,374	2.1	0.0	0.0	0.0	2.1	4.0
Behavioral health/psychiatric	37 (13)	0	1803	0.0					
Genitourinary	5	22	16,902	1.3					
Gerontology	5	4	2674	1.5					
Gynecology	11 (8)	6	5694	1.1					
Labor and delivery	20 (1)	0	255	0.0					
Labor, delivery, recovery, postpartum suite	32 (3)	0	555	0.0					
Level I nursery	10 (2)	1	537	1.9					
Level II nursery	5 (3)	1	979	1.0					
Medical	201 (194)	422	278,221	1.5	0.0	0.0	0.7	2.0	3.4
Medical/surgical	617 (575)	733	618,196	1.2	0.0	0.0	0.0	1.7	3.5
Neurologic	12 (10)	8	10,723	0.7					
Neurosurgical	15 (14)	12	13,866	0.9					
Orthopedic	56 (47)	32	40,425	0.8	0.0	0.0	0.0	0.0	3.2
Pediatric medical	12	18	10,232	1.8					
Pediatric medical/surgical	61 (31)	102	32,581	3.1	0.0	0.0	0.0	2.7	4.7
Postpartum	36 (3)	0	943	0.0					
Rehabilitation	121 (106)	39	47,052	0.8	0.0	0.0	0.0	0.9	2.5
Surgical	93 (87)	189	132,336	1.4	0.0	0.0	0.6	2.0	4.1
Vascular surgery	8	13	11,345	1.1					
Inpatient long-term care units									
Long-term care	9	6	6030	1.0					

Central line utilization ratio[§]

Type of location	No. of locations*	Central line-days	Patient- days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	35	70,932	126,826	0.56	0.29	0.39	0.51	0.78	0.83
Medical cardiac	228	436,409	1,096,749	0.40	0.18	0.27	0.39	0.52	0.61
Medical major teaching	125	549,088	898,028	0.61	0.40	0.54	0.62	0.73	0.79
Medical all others	153	362,388	801,740	0.45	0.14	0.23	0.44	0.57	0.69
Medical/surgical major teaching	182	699,300	1,178,614	0.59	0.32	0.47	0.58	0.71	0.76
Medical/surgical all others ≤15 beds	718 (705)	755,437	1,940,436	0.39	0.11	0.20	0.34	0.50	0.63
Medical/surgical all others >15 beds	280	986,982	1,954,008	0.51	0.28	0.40	0.52	0.61	0.70
Neurologic	24	45,153	100,840	0.45	0.19	0.29	0.44	0.56	0.67

(Continued)

Table 3. (Continued)

Central line utilization ratio[§]									
					Percentile				
Type of location	No. of locations*	Central line-days	Patient- days	Pooled mean	10%	25%	50% (median)	75%	90%
Neurosurgical	72	160,879	362,881	0.44	0.28	0.36	0.44	0.57	0.66
Pediatric cardiothoracic	18	58,626	95,130	0.62					
Pediatric medical	16	17,321	43,797	0.40					
Pediatric medical/surgical	129	314,306	655,402	0.48	0.18	0.29	0.42	0.54	0.65
Respiratory	8	17,223	29,520	0.58					
Surgical	208	729,989	1,230,430	0.59	0.35	0.51	0.62	0.70	0.77
Surgical cardiothoracic	203	632,769	893,084	0.71	0.45	0.58	0.73	0.84	0.92
Trauma	62	224,864	354,494	0.63	0.41	0.54	0.62	0.69	0.77
Inpatient wards									
Adult step-down unit (postcritical care)	145 (144)	141,374	793,149	0.18	0.05	0.08	0.13	0.26	0.39
Behavioral health/psychiatric	37 (35)	1803	83,545	0.02	0.01	0.01	0.02	0.04	0.05
Genitourinary	5	16,902	57,237	0.30					
Gerontology	5	2674	18,567	0.14					
Gynecology	11 (10)	5694	60,466	0.09					
Labor and delivery	20 (19)	255	9546	0.03					
Labor, delivery, recovery, postpartum suite	32 (30)	555	16,346	0.03	0.00	0.01	0.02	0.03	0.12
Level I nursery	10 (8)	537	5225	0.10					
Level II nursery	5	979	3972	0.25					
Medical	201 (200)	278,221	1,408,507	0.20	0.06	0.09	0.17	0.24	0.34
Medical/surgical	617 (613)	618,196	3,839,045	0.16	0.04	0.07	0.11	0.18	0.26
Neurologic	12	10,723	69,343	0.15					
Neurosurgical	15	13,866	83,780	0.17					
Orthopedic	56 (54)	40,425	343,273	0.12	0.03	0.05	0.06	0.10	0.17
Pediatric medical	12	10,232	59,826	0.20	0.02	0.03	0.06	0.14	0.26
Pediatric medical/surgical	61 (58)	32,581	165,571	0.17					
Postpartum	36 (35)	943	67,780	0.01	0.00	0.01	0.01	0.02	0.03
Rehabilitation	121 (120)	47,052	570,671	0.08	0.03	0.05	0.08	0.11	0.17
Surgical	93	132,336	664,399	0.20	0.05	0.10	0.16	0.24	0.32
Vascular surgery	8	11,345	50,079	0.23					
Inpatient long-term care units									
Long-term care	9	6030	63,417	0.10					

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

*Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number <20, then percentile distributions are not calculated.

† $= \frac{\text{Number of CLABSI}}{\text{number of central line-days}} \times 1000$

‡Includes 6 clinical sepsis BSIs.

§ $= \frac{\text{Number of central line-days}}{\text{number of patient-days}}$

wound class, and American Society of Anesthesiology (ASA) score.[4] Unlike the NNIS system, the NHSN operative procedure list does not include ''catchall'' procedure categories, such as ''OCVS, other cardiovascular.''

Eleven new inpatient procedures—AMP, HTP, KTP, LTP, NECK, NEPH, OVRY, PRST, SPLE, THOR, and THYR—and 6 outpatient procedures—APPY, BRST, CHOL, FX, KPRO, and VHYS—had sufficient data to be included in this report (see Table 22 for description and data).

Medication-Associated module

For certain locations, facilities choose to report susceptibility data for selected organisms and/or antimicrobial use data for selected agents. Data from this module were reported separately.[7]

RESULTS

There were 2027 facilities eligible to report to NHSN at the end of 2008, of which 1665 had filed monthly reporting plans signaling their intent to follow one or more of the Patient Safety Component modules for at least 1 month. From this group, a total of 1545 hospitals and 20 outpatient surgery centers had reported at least denominator data for some patient cohorts under surveillance during 2006 to 2008. These 1545 hospitals are located in 48 states and the District of Columbia and are predominantly general acute care hospitals with a mix of bed sizes and medical school affiliations (Tables 1 and 2). For the DA module where data volume was sufficient for this report, we tabulated device-associated infection rates and device utilization (DU) ratios for January

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, 2006 through 2008

Permanent central line–associated BSI rate*

Type of location	No. of locations†	No. of PCLABS	Permanent central line-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Specialty care areas									
Bone marrow transplant	21	235	60,546	3.9	0.0	0.5	1.8	4.7	7.9
Hematology/oncology	41	158	95,535	1.7	0.0	0.1	0.9	2.5	4.8
Long-term acute care	43 (33)	38	23,278	1.6	0.0	0.0	0.0	4.3	6.1
Pediatric hematology/oncology	7	75	32,255	2.3					
Solid organ transplant	9	11	3,953	2.8					

Temporary central line–associated BSI rate‡

Type of location	No. of locations†	No. of TCLABS	Temporary central line-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Specialty care areas									
Bone marrow transplant	18 (17)	96	27,290	3.5					
Hematology/oncology	33 (31)	117	51,950	2.3	0.0	0.0	1.3	2.8	4.5
Long-term acute care	67 (64)	260	149,298	1.7	0.0	0.3	1.4	2.3	4.1
Pediatric hematology/oncology	5	47	10,287	4.6					
Solid organ transplant	12	66	32,591	2.0					

Permanent central line utilization ratio§

Type of location	No. of locations†	Permanent central line-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Specialty care areas									
Bone marrow transplant	21	60,546	100,520	0.60	0.18	0.41	0.57	0.83	0.95
Hematology/oncology	41	95,535	258,892	0.37	0.11	0.25	0.37	0.61	0.74
Long-term acute care	43	23,278	194,796	0.12	0.02	0.04	0.07	0.13	0.41
Pediatric hematology/oncology	7	32,255	50,910	0.63					
Solid organ transplant	9	3953	41,263	0.10					

Temporary central line utilization ratio¶

Type of location	No. of locations†	Temporary central line-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Specialty care areas									
Bone marrow transplant	18	27,290	96,096	0.28					
Hematology/oncology	33	51,950	238,801	0.22	0.07	0.12	0.15	0.25	0.36
Long-term acute care	67	149,298	329,928	0.45	0.05	0.23	0.51	0.69	0.82
Pediatric hematology/oncology	5	10,287	46,142	0.22					
Solid organ transplant	12	32,591	65,694	0.50					

BSI, bloodstream infection; *PCLAB*, permanent central line-associated BSI; *TCLAB*, temporary central line-associated BSI.

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

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number is < 20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of TCLAB}}{\text{Number of temporary central line-days}} \times 1000$.

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

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

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, 2006 through 2008

Urinary catheter–associated UTI rate*

Type of location	No. of locations†	No. of CAUTI	Urinary catheter-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	22	351	47,584	7.4	2.6	3.8	6.2	11.6	12.3
Medical cardiac	108	1457	302,388	4.8	0.0	2.1	4.1	6.3	9.4
Medical major teaching	53	1531	324,082	4.7	1.0	2.3	3.8	6.5	8.9
Medical all others	59	1135	289,636	3.9	0.0	1.6	3.0	5.9	8.2
Medical/surgical major teaching	89	1853	546,824	3.4	0.4	1.6	3.1	4.7	6.6
Medical/surgical all others	235 (230)	1586	459,741	3.4	0.0	0.0	2.1	4.3	6.2
≤15 beds									
Medical/surgical all others	111 (110)	2104	675,759	3.1	0.0	1.0	2.6	4.5	7.3
>15 beds									
Neurologic	15	369	49,681	7.4					
Neurosurgical	32	938	135,006	6.9	1.6	4.4	7.3	9.0	10.8
Pediatric cardiothoracic	6 (5)	27	6079	4.4					
Pediatric medical	5 (4)	8	2025	4.0					
Pediatric medical/surgical	53 (51)	377	88,718	4.2	0.0	0.8	3.4	5.6	7.2
Surgical	95	2033	474,506	4.3	0.7	1.7	3.4	5.5	9.1
Surgical cardiothoracic	86 (85)	1094	307,988	3.6	0.7	2.1	3.2	4.8	7.0
Trauma	37	1151	212,948	5.4	0.2	3.6	5.7	7.1	8.1
Specialty care areas									
Bone marrow transplant	11 (10)	25	6495	3.8					
Hematology/oncology	32 (31)	197	28,702	6.9	0.1	1.9	4.2	8.8	11.8
Pediatric hematology/oncology	5 (3)	1	869	1.2					
Long-term acute care	51	695	124,487	5.6	0.7	1.7	4.0	9.1	14.3
Solid organ transplant	6	51		8312	6.1				
Inpatient wards									
Adult step-down unit (postcritical care)	130 (124)	1295	189,265	6.8	0.2	2.6	5.6	10.3	13.2
Behavioral health/psychiatric	66 (24)	22	3264	6.7	0.0	0.0	0.0	8.5	17.6
Gerontology	5 (4)	5	2330	2.1					
Gynecology	10 (9)	34	8356	4.1					
Labor and delivery	27 (22)	9	7539	1.2	0.0	0.0	0.0	1.8	6.2
Labor, delivery, recovery, postpartum suite	57 (51)	35	17,991	1.9	0.0	0.0	0.0	1.5	6.2
Medical	174 (170)	1570	232,766	6.7	1.2	2.9	5.8	10.0	14.4
Medical/surgical	559 (544)	4224	717,604	5.9	0.0	2.2	4.9	8.2	12.1
Neurologic	10		120	13,228	9.1				
Neurosurgical	14 (13)	151	17,093	8.8					
Orthopedic	53	522	86,277	6.1	0.0	1.4	5.4	8.2	9.4
Pediatric medical	11 (2)	2	297	6.7					
Pediatric medical/surgical	54 (29)	91	12,604	7.2	0.0	0.0	2.8	8.6	14.0
Postpartum	68 (65)	49	37,003	1.3	0.0	0.0	0.0	2.6	4.3
Rehabilitation	123 (118)	1071	74,481	14.4	0.0	6.5	14.5	24.7	35.2
Surgical	83 (82)	949	146,387	6.5	0.0	2.7	5.4	8.6	11.8
Inpatient long-term care units									
Behavioral health/psychiatric	5 (2)	0	603	0.0					
Long-term care	11 (10)	60	14,376	4.2					

Urinary catheter utilization ratio‡

Type of location	No. of locations†	Urinary catheter-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	22	47,584	78,304	0.61	0.24	0.46	0.59	0.75	0.91
Medical cardiac	108	302,388	536,190	0.56	0.29	0.48	0.62	0.69	0.78

Table 5. (Continued)

Type of location	No. of locations[†]	Urinary catheter-days	Patient-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
Urinary catheter utilization ratio[‡]									
Medical major teaching	53	324,082	447,282	0.72	0.56	0.67	0.76	0.83	0.86
Medical all others	59	289,636	389,397	0.74	0.47	0.62	0.73	0.85	0.90
Medical/surgical major teaching	89	546,824	700,556	0.78	0.54	0.65	0.79	0.85	0.90
Medical/surgical all others ≤15 beds	235 (233)	459,741	717,260	0.64	0.38	0.53	0.66	0.80	0.86
Medical/surgical all others >15 beds	111 (110)	675,759	858,552	0.79	0.60	0.72	0.78	0.84	0.87
Neurologic	15	49,681	64,539	0.77					
Neurosurgical	32	135,006	176,565	0.76	0.46	0.68	0.78	0.86	0.89
Pediatric cardiothoracic	6	6079	26,502	0.23					
Pediatric medical	5	2025	9873	0.21					
Pediatric medical/surgical	53	88,718	308,116	0.29	0.13	0.19	0.27	0.34	0.41
Surgical	95	474,506	588,523	0.81	0.63	0.75	0.82	0.88	0.94
Surgical cardiothoracic	86	307,988	399,731	0.77	0.44	0.62	0.79	0.88	0.95
Trauma	37	212,948	240,301	0.89	0.66	0.80	0.90	0.93	0.96
Specialty care areas									
Bone marrow transplant	11	6495	56,182	0.12					
Hematology/oncology	32	28,702	141,304	0.20	0.08	0.13	0.20	0.25	0.41
Long-term acute care	51	124,487	267,233	0.47	0.11	0.36	0.56	0.67	0.78
Pediatric hematology/oncology	5	869	21,167	0.04					
Solid organ transplant	6	8312	37,723	0.22					
Inpatient wards									
Adult step-down unit (postcritical care)	130 (128)	189,265	726,161	0.26	0.11	0.15	0.22	0.39	0.53
Behavioral health/psychiatric	66 (63)	3264	142,396	0.02	0.00	0.01	0.02	0.04	0.05
Gerontology	5 (4)	2330	9607	0.24					
Gynecology	10	8356	46,388	0.18					
Labor and delivery	27	7539	38,716	0.19	0.01	0.05	0.14	0.29	0.38
Labor, delivery, recovery, postpartum suite	57 (56)	17,991	107,894	0.17	0.07	0.11	0.15	0.22	0.30
Medical	174	232,766	1,182,850	0.20	0.09	0.12	0.16	0.24	0.36
Medical/surgical	559 (554)	717,604	3,325,379	0.22	0.11	0.15	0.20	0.26	0.37
Neurologic	10	13,228	62,958	0.21					
Neurosurgical	14	17,093	62,659	0.27					
Orthopedic	53 (52)	86,277	311,694	0.28	0.13	0.21	0.26	0.36	0.42
Pediatric medical	11	297	23,650	0.01					
Pediatric medical/surgical	54	12,604	138,517	0.09	0.01	0.02	0.05	0.12	0.20
Postpartum	68	37,003	242,277	0.15	0.07	0.11	0.15	0.19	0.34
Rehabilitation	123 (122)	74,481	660,670	0.11	0.04	0.06	0.08	0.12	0.18
Surgical	83	146,387	555,808	0.26	0.15	0.18	0.24	0.31	0.42
Inpatient long-term care units									
Behavioral health/psychiatric	5	603	61,434	0.01					
Long-term care	11	14,376	87,740	0.16					

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

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

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number is <20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of urinary catheter-days}}{\text{Number of patient-days}}$.

2006 through December 2008 (Tables 3 to 12). Data on select attributes of the device-associated infections are provided in Tables 13 to 20. For the PA module where sufficient data existed, we tabulated procedure-associated infection rates for this same period (Tables 21 to 23).

Tables 3 to 6 update and augment previously published device-associated rates and DU ratios by type of non-NICU locations.[1] For inclusion in these tables, the pooled mean infection rates and DU ratios required data from at least 5 different locations of a given 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. Because of this, the number

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, 2006 through 2008

Ventilator-associated PNEU rate*

Type of location	No. of locations†	No. of VAP	Ventilator-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	25	364	34,088	10.7	0.0	2.4	7.4	13.1	15.1
Medical cardiac	129 (123)	366	174,480	2.1	0.0	0.0	1.2	2.8	5.8
Medical major teaching	77	690	281,990	2.4	0.0	1.0	2.2	4.2	8.3
Medical all others	80 (76)	398	181,102	2.2	0.0	0.0	1.3	3.5	6.1
Medical/surgical major teaching	115 (109)	1093	383,068	2.9	0.0	0.9	2.0	3.1	5.6
Medical/surgical all others ≤15 beds	325 (272)	621	282,004	2.2	0.0	0.0	0.7	3.0	5.8
Medical/surgical all others >15 beds	138 (137)	904	469,719	1.9	0.0	0.4	1.3	3.0	4.2
Neurologic	15 (13)	170	25,528	6.7					
Neurosurgical	42	407	76,763	5.3	0.0	2.6	4.0	5.6	8.2
Pediatric cardiothoracic	10	11	18,316	0.6					
Pediatric medical	9 (8)	8	3509	2.3					
Pediatric medical/surgical	79 (76)	317	172,208	1.8	0.0	0.0	0.7	2.7	4.6
Respiratory	5	4	8748	0.5					
Surgical	127 (126)	1515	311,739	4.9	0.0	1.8	3.8	6.5	9.9
Surgical cardiothoracic	109 (107)	831	214,373	3.9	0.0	0.9	2.6	5.4	9.7
Trauma	41	1173	145,294	8.1	0.0	2.1	5.2	10.0	16.1
Specialty care areas									
Long-term acute care	28 (27)	50	43,208	1.2	0.0	0.0	0.0	0.7	2.9
Inpatient wards									
Adult step-down unit (postcritical care)	35 (29)	56	18,760	3.0	0.0	0.0	1.3	4.7	6.0
Medical	12 (6)	4	9783	0.4					
Medical/surgical	19 (11)	9	12,421	0.7					
Pulmonary	5	2	2129	0.9					

Ventilator utilization ratio‡

Type of location	No. of locations†	Ventilator-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Critical care units									
Burn	25	34,088	90,906	0.37	0.12	0.19	0.41	0.53	0.70
Medical cardiac	129 (128)	174,480	636,144	0.27	0.09	0.18	0.25	0.37	0.46
Medical major teaching	77	281,990	585,593	0.48	0.27	0.38	0.48	0.60	0.67
Medical all others	80	181,102	498,463	0.36	0.07	0.20	0.34	0.46	0.54
Medical/surgical major teaching	115	383,068	870,206	0.44	0.15	0.30	0.40	0.54	0.62
Medical/surgical all others ≤15 beds	325 (320)	282,004	965,299	0.29	0.06	0.13	0.24	0.38	0.46
Medical/surgical all others >15 beds	138	469,719	1,255,856	0.37	0.21	0.29	0.37	0.43	0.53
Neurologic	15	25,528	66,882	0.38					
Neurosurgical	42	76,763	212,778	0.36	0.22	0.28	0.34	0.43	0.54
Pediatric cardiothoracic	10	18,316	51,610	0.35					
Pediatric medical	9	3509	15,649	0.22					
Pediatric medical/surgical	79 (78)	172,208	413,123	0.42	0.18	0.27	0.37	0.47	0.56
Respiratory	5	8748	18,856	0.46					
Surgical	127	311,739	802,912	0.39	0.21	0.28	0.37	0.50	0.58
Surgical cardiothoracic	109	214,373	553,214	0.39	0.19	0.26	0.36	0.47	0.56
Trauma	41	145,294	255,374	0.57	0.37	0.47	0.55	0.62	0.74
Specialty care areas									
Long-term acute care	28	43,208	124,736	0.35	0.07	0.15	0.28	0.49	0.67
Inpatient wards									
Adult step-down unit (postcritical care)	35 (34)	18,760	194,639	0.10	0.01	0.03	0.10	0.16	0.27
Medical	12	9783	63,746	0.15					
Medical/surgical	19 (18)	12,421	76,360	0.16					
Pulmonary	5	2129	19,601	0.11					

PNEU, pneumonia infection; *VAP*, ventilator-associated PNEU.

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

†Number of locations meeting minimum requirements for percentile distributions if less than total the number of locations. If this number is < 20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$.

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, 2006 through 2008

Central line-associated BSI rate*

Birth-weight category	No. of locations†	No. of CLABSI	Central line-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	142 (124)	481	122,272	3.9	0.0	0.0	3.2	5.3	8.0
751-1000 g	153 (133)	373	111,293	3.4	0.0	0.0	2.5	4.8	7.5
1001-1500 g	154 (136)	276	112,926	2.4	0.0	0.0	1.4	3.5	6.0
1501-2500 g	152 (117)	216	90,384	2.4	0.0	0.0	0.7	3.5	4.8
>2500 g	145 (106)	157	82,677	1.9	0.0	0.0	0.0	2.6	6.1

Central line utilization ratio‡

Birth-weight category	No. of locations†	Central line-days	Patient-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	142 (139)	122,272	345,082	0.35	0.19	0.28	0.35	0.46	0.56
751-1000 g	153 (145)	111,293	348,976	0.32	0.16	0.25	0.30	0.41	0.55
1001-1500 g	154 (151)	112,926	472,563	0.24	0.10	0.15	0.22	0.33	0.50
1501-2500 g	152 (148)	90,384	547,895	0.16	0.04	0.07	0.12	0.21	0.37
>2500 g	145 (140)	82,677	420,114	0.20	0.04	0.07	0.13	0.21	0.35

BSI, bloodstream infection (includes laboratory-confirmed BSI and clinical sepsis BSI); *CLABSI*, central line–associated BSI.

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

†Number of locations meeting minimum requirements for percentile distributions if less than total number of locations. If this number is <20, percentile distributions are not calculated.

‡$= \frac{\text{Number of central line-days}}{\text{Number of patient-days}}$.

Table 8. Pooled means and key percentiles of the distribution of umbilical catheter–associated BSI rates and umbilical catheter utilization ratios for level III NICUs, DA module, 2006 through 2008

Umbilical catheter-associated BSI rate*

Birth-weight category	No. of locations†	No. of UCAB	Umbilical catheter-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	141 (108)	129	32,948	3.9	0.0	0.0	0.0	5.5	9.6
751-1000 g	146 (111)	75	29,492	2.5	0.0	0.0	0.0	4.4	8.8
1001-1500 g	147 (122)	59	34,379	1.7	0.0	0.0	0.0	2.5	6.1
1501-2500 g	143 (107)	28	32,499	0.9	0.0	0.0	0.0	0.0	3.2
>2500 g	150 (111)	40	45,568	0.9	0.0	0.0	0.0	0.0	2.5

Umbilical catheter utilization ratio‡

Birth-weight category	No. of locations†	Umbilical catheter-days	Patient-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	141 (132)	32,948	298,854	0.11	0.05	0.09	0.13	0.20	0.32
751-1000 g	146 (140)	29,492	301,167	0.10	0.05	0.07	0.12	0.19	0.27
1001-1500 g	147 (146)	34,379	420,419	0.08	0.04	0.05	0.08	0.16	0.23
1501-2500 g	143 (142)	32,499	509,693	0.06	0.02	0.03	0.06	0.10	0.14
>2500 g	150 (148)	45,568	437,876	0.10	0.04	0.06	0.10	0.15	0.21

BSI, bloodstream infection, includes laboratory-confirmed BSI and clinical sepsis BSI; *UCAB*, umbilical catheter-associated BSI.

*$= \frac{\text{Number of CLABSI}}{\text{Number of umbilical catheter-days}} \times 1000$

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number is <20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of umbilical catheter-days}}{\text{Number of patient-days}}$.

Table 9. 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, 2006 through 2008

Central line-associated BSI rate*

Birth-weight category	No. of locations†	No. of CLABSI	Central line-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
≤750 g	96 (75)	250	60,199	4.9	0.0	0.0	2.6	6.4	10.2
751-1000 g	112 (84)	159	49,673	3.2	0.0	0.0	1.7	6.8	9.6
1001-1500 g	125 (93)	120	58,893	2.0	0.0	0.0	0.6	3.4	6.4
1501-2500 g	119 (73)	65	43,544	1.5	0.0	0.0	0.0	3.0	6.4
>2500 g	116 (60)	49	39,669	1.2	0.0	0.0	0.0	1.8	5.1

Central line utilization ratio‡

Birth-weight category	No. of locations†	Central line-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
≤750 g	96 (84)	60,199	152,651	0.39	0.17	0.29	0.37	0.49	0.55
751-1000 g	112 (96)	49,673	146,195	0.34	0.15	0.24	0.32	0.41	0.55
1001-1500 g	125 (113)	58,893	227,512	0.26	0.08	0.13	0.21	0.31	0.39
1501-2500 g	119 (113)	43,544	257,820	0.17	0.03	0.06	0.10	0.16	0.28
>2500 g	116 (105)	39,669	180,044	0.22	0.03	0.06	0.09	0.19	0.30

BSI, bloodstream infection, includes laboratory-confirmed BSI and clinical sepsis BSI; *CLABSI*, central line-associated BSI.

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

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number is <20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of central line-days}}{\text{Number of patient-days}}$.

Table 10. Pooled means and key percentiles of the distribution of umbilical catheter–associated BSI rates and umbilical catheter utilization ratios for level II/III NICUs, DA module, 2006 through 2008

Umbilical catheter-associated BSI rate*

Birth-weight category	No. of locations†	No. of UCAB	Umbilical catheter-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
≤750 g	101 (64)	98	17,084	5.7	0.0	0.0	4.0	9.3	13.8
751-1000 g	111 (76)	51	16,128	3.2	0.0	0.0	0.0	3.5	11.3
1001-1500 g	123 (82)	33	19,459	1.7	0.0	0.0	0.0	1.5	7.5
1501-2500 g	123 (90)	19	18,724	1.0	0.0	0.0	0.0	0.0	4.2
>2500 g	127 (78)	26	25,890	1.0	0.0	0.0	0.0	0.0	2.6

Umbilical catheter utilization ratio‡

Birth-weight category	No. of locations†	Umbilical catheter-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
≤750 g	101 (81)	17,084	120,726	0.14	0.08	0.11	0.19	0.26	0.37
751-1000 g	111 (93)	16,128	128,376	0.13	0.07	0.09	0.15	0.20	0.26
1001-1500 g	123 (113)	19,459	201,996	0.10	0.05	0.08	0.11	0.15	0.23
1501-2500 g	123 (120)	18,724	269,661	0.07	0.02	0.04	0.07	0.11	0.21
>2500 g	127 (121)	25,890	208,806	0.12	0.04	0.06	0.10	0.16	0.23

BSI, bloodstream infection (includes laboratory-confirmed BSI and clinical sepsis BSI); *UCAB*, umbilical catheter-associated BSI.

*$= \frac{\text{Number of UCAB}}{\text{Number of umbilical catheter-days}} \times 1000$.

†Number of locations meeting minimum requirements for percentile distributions if less than total number of locations. If this number <20, percentile distributions are not calculated.

‡$= \frac{\text{Number of umbilical catheter-days}}{\text{Number of patient-days}}$.

Table 11. Pooled means and key percentiles of the distribution of ventilator-associated PNEU rates and ventilator utilization ratios for level III NICUs, DA module, 2006 through 2008

Ventilator-associated PNEU rate*

Birth-weight category	No. of locations†	No. of VAP	Ventilator-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	81 (72)	214	95,841	2.2	0.0	0.0	1.3	3.1	7.3
751-1000 g	85 (73)	105	58,055	1.8	0.0	0.0	0.0	3.5	7.4
1001-1500 g	84 (68)	50	36,439	1.4	0.0	0.0	0.0	1.4	3.7
1501-2500 g	83 (57)	25	28,996	0.9	0.0	0.0	0.0	0.6	2.2
>2500 g	86 (61)	27	36,010	0.7	0.0	0.0	0.0	0.0	2.1

Ventilator utilization ratio‡

Birth-weight category	No. of locations†	Ventilator-days	Patient-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	81 (78)	95,841	203,127	0.47	0.29	0.40	0.45	0.60	0.77
751-1000 g	85 (81)	58,055	194,123	0.30	0.14	0.19	0.28	0.41	0.60
1001-1500 g	84 (82)	36,439	260,592	0.14	0.05	0.08	0.13	0.20	0.34
1501-2500 g	83 (81)	28,996	324,770	0.09	0.02	0.03	0.06	0.14	0.26
>2500 g	86 (84)	36,010	256,418	0.14	0.03	0.05	0.10	0.19	0.25

PNEU, pneumonia infection; *VAP*, ventilator-associated PNEU.

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

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number is <20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$.

Table 12. Pooled means and key percentiles of the distribution of ventilator-associated PNEU rates and ventilator utilization ratios for level II/III NICUs, DA module, 2006 through 2008

Ventilator-associated PNEU rate*

Birth-weight category	No. of locations†	No. of VAP	Ventilator-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	56 (47)	103	38,321	2.7	0.0	0.0	1.1	4.7	12.6
751-1000 g	63 (47)	65	23,147	2.8	0.0	0.0	0.2	4.0	8.6
1001-1500 g	67 (46)	16	15,358	1.0	0.0	0.0	0.0	0.0	4.0
1501-2500 g	70 (40)	10	12,503	0.8	0.0	0.0	0.0	0.0	2.1
>2500 g	69 (44)	10	16,839	0.6	0.0	0.0	0.0	0.0	2.6

Ventilator utilization ratio‡

Birth-weight category	No. of locations†	Ventilator-days	Patient-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
≤750 g	56 (49)	38,321	86,680	0.44	0.28	0.34	0.48	0.58	0.75
751-1000 g	63 (56)	23,147	78,224	0.30	0.13	0.20	0.28	0.37	0.47
1001-1500 g	67 (63)	15,358	115,307	0.13	0.05	0.07	0.11	0.18	0.27
1501-2500 g	70 (69)	12,503	147,933	0.08	0.02	0.03	0.05	0.11	0.20
>2500 g	69 (66)	16,839	119,087	0.14	0.03	0.05	0.10	0.14	0.26

PNEU, pneumonia infection; *VAP*, ventilator-associated PNEU.

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

†Number of locations meeting minimum requirements for percentile distributions if less than the total number of locations. If this number <20, then percentile distributions are not calculated.

‡$= \frac{\text{Number of ventilator-days}}{\text{Number of patient-days}}$.

Table 13. Distribution of criteria for central line–associated laboratory-confirmed BSI by location, 2006 through 2008

	LCBI						
Type of location	**Criterion 1**		**Criterion 2**		**Criterion 3**		**Total**
Critical care units							
Burn	344	88.2%	46	11.8%			390
Medical cardiac	707	80.7%	169	19.3%			876
Medical major teaching	1232	87.4%	178	12.6%			1410
Medical all others	547	79.6%	140	20.4%			687
Medical/surgical major teaching	1097	74.4%	377	25.6%			1474
Medical/surgical all others ≤15 beds	844	74.7%	286	25.3%			1130
Medical/surgical all others >15 beds	1023	70.6%	426	29.4%			1449
Neurologic	49	80.3%	12	19.7%			61
Neurosurgical	305	77.0%	91	23.0%			396
Pediatric cardiothoracic	171	87.7%	23	11.8%	1	0.5%	195
Pediatric medical	20	87.0%	3	13.0%			23
Pediatric medical/surgical*	770	83.4%	152	16.5%	1	0.1%	923
Respiratory	26	89.7%	3	10.3%			29
Surgical	1358	80.7%	325	19.3%			1683
Surgical cardiothoracic	680	77.4%	199	22.6%			879
Trauma	700	86.0%	114	14.0%			814
Inpatient wards							
Adult step-down unit (postcritical care)	239	79.9%	60	20.1%			299
Genitourinary	14	63.6%	8	36.4%			22
Gerontology	3	75.0%	1	25.0%			4
Gynecology	4	66.7%	2	33.3%			6
Level I nursery	1	100.0%					1
Level II nursery	1	100.0%					1
Medical	338	80.1%	84	19.9%			422
Medical/surgical	560	76.4%	173	23.6%			733
Neurologic	8	100.0%					8
Neurosurgical	9	75.0%	3	25.0%			12
Orthopedic	21	65.6%	11	34.4%			32
Pediatric medical/surgical	72	70.6%	30	29.4%			102
Pediatric medical	15	83.3%	3	16.7%			18
Rehabilitation	29	74.4%	10	25.6%			39
Surgical	131	69.3%	58	30.7%			189
Vascular surgery	6	46.2%	7	53.8%			13
Inpatient long-term care units							
Long-term care	5	83.3%	1	16.7%			6
Total	11,329	79.1%	2995	20.9%	2	0.0%	14,326

NOTE. LCBI criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures, and organism cultured from blood is not related to an infection at another site.[3]

LCBI criterion 2: Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension, and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

LCBI criterion 3: Patient age <1 year has at least one of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia, and signs and symptoms, and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

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

*Six CSEPs reported from these locations.

of locations contributing data may vary among the tables. Laboratory-confirmed bloodstream infection (LCBI) criteria 2b and 3b were discontinued in January 2008; therefore, the CLABSI rate tables exclude all BSIs that were reported using these criteria in 2006-2007. An exception to this occurred in pediatric medical/surgical ICU where 6 CLABSIs were reported using the clinical sepsis criteria for neonates.

Tables 7 to 12 update and augment the previously published, device-associated rates and DU ratios by birth-weight category for NICU locations.[1] For NICUs in the DA module, device-days consist of the total number of central line-days, umbilical catheter-days, or ventilator-days. Each of the pooled mean rates in NICUs required data from at least 5 different locations for a given type of nursery and birth-weight

Table 14. Distribution of criteria for permanent and temporary central line–associated laboratory confirmed BSI by location, 2006 through 2008

Type of location	LCBI				Total
	Criterion 1		Criterion 2		
Permanent central line					
Bone marrow transplant	176	74.9%	59	25.1%	235
Hematology/oncology	104	65.8%	54	34.2%	158
Long-term acute care	35	92.1%	3	7.9%	38
Pediatric hematology/oncology	56	74.7%	19	25.3%	75
Solid organ transplant	4	36.4%	7	63.6%	11
Total	375	72.5%	142	27.5%	517
Temporary central line					
Bone marrow transplant	66	68.8%	30	31.3%	96
Hematology/oncology	77	65.8%	40	34.2%	117
Long-term acute care	194	74.6%	66	25.4%	260
Pediatric hematology/oncology	26	55.3%	21	44.7%	47
Solid organ transplant	50	75.8%	16	24.2%	66
Total	413	70.5%	173	29.5%	586

NOTE. LCBI criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures, and organism cultured from blood is not related to an infection at another site.[3]

LCBI criterion 2: Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

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

category. For 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. Because of this, the number of units contributing data varies in the tables.

Tables 13 to 20 provide data on select attributes of the device-associated infections for each location. For example, Tables 13, 14, 17, and 18 show the frequency and percent distribution of the specific sites of BSI and the criterion used for identifying these infections. Note that for adult and pediatric ICUs and wards, only laboratory-confirmed BSI are allowed and shown, unless neonates are included in pediatric wards, in which case a BSI may be reported using clinical sepsis criteria. Otherwise, clinical sepsis is only included as a valid BSI event for neonates in NICU. A total of 6 device-associated clinical sepsis BSIs for pediatric medical/surgical ICU were reported.

Table 21 provides data on PPP rates by procedure. Note that although pooled means and percentile distributions are included, the volume of data is still low and the rates should be considered provisional.

Tables 22 and 23 update and augment previously published SSI rates by operative procedure type and NNIS risk index categories.[1] For inclusion in these tables, the pooled mean infection rates required data from at least 5 different hospitals. For the percentile distributions, data from at least 20 different hospitals were required; therefore, PPP or SSI rates for hospitals that did not report at least 20 NHSN operative procedures for a given type of NHSN procedure were excluded.

DISCUSSION

The characteristics of hospitals reporting to NHSN continue to evolve since the first report was published,[8] including a sustained influx of smaller hospitals. This trend is likely due to 2 factors: (1) mandatory HAI reporting laws in Colorado, Connecticut, Delaware, Illinois, Massachusetts, Maryland, Oklahoma, Pennsylvania, Tennessee, Virginia, and Washington that require data to be reported through NHSN to their respective responsible state agencies, and (2) opening of enrollment in NHSN to all hospitals regardless of size beginning in June 2007. As more states opt to use NHSN as their operational system for mandatory HAI reporting requirements and as enrollment is opened to more types of facilities (eg, long-term acute care and outpatient [ambulatory] surgery centers), an even more diverse group of health care facilities may report to NHSN in the future.

Comparing these data to the last NHSN Report reveal several differences in the reported data. All CLABSI rates exclude BSIs reported using criterion 2b or 3b due to a recent change in the BSI definition.[3] This allows unpublished hospital-specific CLABSI rates collected using the changed BSI definition to be compared directly to the aggregate data included in this report. Another important change is the differing composition of reporting hospitals, which is apparent in the nearly 3-fold increase in the number of medical/surgical ICUs from nonmajor teaching hospitals reporting CLABSI rates that are now stratified into 2 unit bed size groups. In these 2 types of ICUs, the

Table 15. Distribution of specific sites of urinary catheter–associated UTI by location, 2006 through 2008

Type of location	ASB		SUTI		Total
Critical care units					
Burns	89	25.4%	262	74.6%	351
Medical cardiac	771	52.9%	686	47.1%	1457
Medical major teaching	598	39.1%	933	60.9%	1531
Medical all others	588	51.8%	547	48.2%	1135
Medical/surgical major teaching	745	40.2%	1108	59.8%	1853
Medical/surgical all others ≤15 beds	919	57.9%	667	42.1%	1586
Medical/surgical all others >15 beds	986	46.9%	1118	53.1%	2104
Neurologic	204	55.3%	165	44.7%	369
Neurosurgical	319	34.0%	619	66.0%	938
Pediatric cardiothoracic	9	33.3%	18	66.7%	27
Pediatric medical	0	0.0%	8	100.0%	8
Pediatric medical/surgical	97	25.7%	280	74.3%	377
Surgical	873	42.9%	1160	57.1%	2033
Surgical cardiothoracic	555	50.7%	539	49.3%	1094
Trauma	327	28.4%	824	71.6%	1151
Specialty care areas					
Bone marrow transplant	11	44.0%	14	56.0%	25
Hematology/oncology	110	55.8%	87	44.2%	197
Pediatric hematology/oncology	1	100.0%	0	0.0%	1
Long-term acute care	360	51.8%	335	48.2%	695
Solid organ transplant	13	25.5%	38	74.5%	51
Inpatient wards					
Adult step-down unit (postcritical care)	800	61.8%	495	38.2%	1295
Behavioral health/psychiatric	18	81.8%	4	18.2%	22
Gerontology	4	80.0%	1	20.0%	5
Gynecology	22	64.7%	12	35.3%	34
Labor and delivery	3	33.3%	6	66.7%	9
Labor, delivery, recovery, postpartum suite	12	34.3%	23	65.7%	35
Medical	955	60.8%	615	39.2%	1570
Medical/surgical	2642	62.5%	1582	37.5%	4224
Neurologic	67	55.8%	53	44.2%	120
Neurosurgical	88	58.3%	63	41.7%	151
Orthopedic	308	59.0%	214	41.0%	522
Pediatric medical/surgical	60	65.9%	31	34.1%	91
Pediatric medical	0	0.0%	2	100.0%	2
Postpartum	28	57.1%	21	42.9%	49
Rehabilitation	665	62.1%	406	37.9%	1071
Surgical	554	58.4%	395	41.6%	949
Inpatient long-term care units					
Long-term care	20	33.3%	40	66.7%	60
Total	13,821	50.8%	13,371	49.2%	27,192

ASB, asymptomatic bacteriuria; *UTI*, urinary tract infection; *SUTI*, symptomatic UTI.

pooled mean CLABSI rates were 1.5 CLABSIs per 1000 central line-days; however, their distributions are statistically significantly different from each other. Furthermore, the pooled mean CAUTI and VAP rates along with their distributions were significantly different as well. The relatively large number of medical/surgical ICUs reporting from non–major teaching hospitals was an important factor that enabled this further stratification. There has been increased reporting of device-associated infections from inpatient wards, which is apparent in the 5-fold increase in the number of medical wards reporting CLABSI rates. In this type of inpatient ward, the pooled mean CLABSI rate was reduced from 1.8 to 1.5 CLABSIs per 1000 central line-days. This reduction may be due to the definition change, the increased contribution of data from smaller hospitals that generally have lower risks of HAI, and an increase in the implementation and effectiveness of HAI prevention strategies.[9] As the number and types of inpatient wards and specialty care areas reporting data grow over time, we will continue to be better able to characterize the risk of device-associated infections among these patients.

In this report, several of the device-associated rates in NICUs were lower compared with the previous report.[1] Furthermore, though the number of device

Table 16. Distribution of specific sites of ventilator-associated pneumonia by location, 2006 through 2008

Type of location	PNU1		PNU2		PNU3		Total
Critical care units							
Burn	253	69.5%	110	30.2%	1	0.3%	364
Medical cardiac	237	64.8%	126	34.4%	3	0.8%	366
Medical major teaching	531	77.0%	151	21.9%	8	1.2%	690
Medical all others	257	64.6%	138	34.7%	3	0.8%	398
Medical/surgical major teaching	708	64.8%	383	35.0%	2	0.2%	1093
Medical/surgical all others ≤15 beds	336	54.1%	279	44.9%	6	1.0%	621
Medical/surgical all others >15 beds	530	58.6%	368	40.7%	6	0.7%	904
Neurologic	129	75.9%	41	24.1%	0	0.0%	170
Neurosurgical	244	60.0%	163	40.0%	0	0.0%	407
Pediatric cardiothoracic	8	72.7%	3	27.3%	0	0.0%	11
Pediatric medical	8	100.0%	0	0.0%	0	0.0%	8
Pediatric medical/surgical	238	75.1%	75	23.7%	4	1.3%	317
Respiratory	2	50.0%	2	50.0%	0	0.0%	4
Surgical	979	64.6%	488	32.2%	48	3.2%	1515
Surgical cardiothoracic	476	57.3%	346	41.6%	9	1.1%	831
Trauma	493	42.0%	678	57.8%	2	0.2%	1173
Specialty care areas							
Long-term acute care	42	84.0%	7	14.0%	1	2.0%	50
Inpatient wards							
Adult step-down unit (postcritical care)	46	82.1%	9	16.1%	1	1.8%	56
Medical	3	75.0%	1	25.0%	0	0.0%	4
Medical/surgical	7	77.8%	2	22.2%	0	0.0%	9
Pulmonary	2	100.0%	0	0.0%	0	0.0%	2
Total	5529	61.5%	3370	37.5%	94	1.0%	8993

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

Table 17. Distribution of specific sites and criteria for device-associated BSI among level III NICUs by birthweight, 2006 through 2008

	LCBI								
Birth-weight category	Criterion 1		Criterion 2		Criterion 3		CSEP		Total
Central line–associated BSI									
≤750 g	317	65.9%	100	20.8%	29	6.0%	35	7.3%	481
750-1000 g	251	67.3%	74	19.8%	23	6.2%	25	6.7%	373
1001-1500 g	177	64.1%	62	22.5%	16	5.8%	21	7.6%	276
1501-2500 g	139	64.4%	54	25.0%	8	3.7%	15	6.9%	216
>2500 g	94	59.9%	41	26.1%	2	1.3%	20	12.7%	157
Total	978	65.1%	331	22.0%	78	5.2%	116	7.7%	1503
Umbilical catheter–associated BSI									
≤750 g	93	72.1%	18	14.0%	2	1.6%	16	12.4%	129
750-1000 g	39	52.0%	18	24.0%	8	10.7%	10	13.3%	75
1001-1500 g	32	54.2%	14	23.7%	5	8.5%	8	13.6%	59
1501-2500 g	17	60.7%	4	14.3%	1	3.6%	6	21.4%	28
>2500 g	22	55.0%	9	22.5%	2	5.0%	7	17.5%	40
Total	203	61.4%	63	19.0%	18	5.4%	47	14.2%	331

NOTE. LCBI criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures, and organism cultured from blood is not related to an infection at another site.[3]

LCBI criterion 2: Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension, and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S* epidermidis], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

LCBI criterion 3: Patient age <1 year has at least one of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia, and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

BSI, bloodstream infection; *LCBI*, laboratory-confirmed bloodstream infection; *CSEP*, clinical sepsis.

Table 18. Distribution of specific sites and criteria for device-associated BSI among level II/III NICUs by birthweight, 2006 through 2008

	LCBI								
Birth-weight category	**Criterion 1**		**Criterion 2**		**Criterion 3**		**CSEP**		**Total**
Central line-associated BSI									
≤750 g	152	60.8%	70	28.0%	15	6.0%	13	5.2%	250
750-1000 g	98	61.6%	44	27.7%	11	6.9%	6	3.8%	159
1001-1500 g	78	65.0%	31	25.8%	4	3.3%	7	5.8%	120
1501-2500 g	47	72.3%	16	24.6%	2	3.1%	0	0.0%	65
>2500 g	28	57.1%	16	32.7%	0	0.0%	5	10.2%	49
Total	403	62.7%	177	27.5%	32	5.0%	31	4.8%	643
Umbilical catheter–associated BSI									
≤750 g	58	59.2%	30	30.6%	4	4.1%	6	6.1%	98
750-1000 g	32	62.7%	12	23.5%	2	3.9%	5	9.8%	51
1001-1500 g	23	69.7%	7	21.2%	2	6.1%	1	3.0%	33
1501-2500 g	13	68.4%	3	15.8%	1	5.3%	2	10.5%	19
>2500 g	17	65.4%	4	15.4%	0	0.0%	5	19.2%	26
Total	143	63.0%	56	24.7%	9	4.0%	19	8.4%	227

NOTE. LCBI criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures and organism cultured from blood is not related to an infection at another site.[3]

LCBI criterion 2: Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension, and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

LCBI criterion 3: Patient age < 1 year has at least one of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia, and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (ie, diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], *viridans* group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from 2 or more blood cultures drawn on separate occasions.[3]

BSI, bloodstream infection; *LCBI*, laboratory-confirmed bloodstream infection; *CSEP*, clinical sepsis.

Table 19. Distribution of specific sites of ventilator-associated pneumonia among level III NICUs by birth weight, 2006 through 2008

Birth-weight category	**PNU1**		**PNU2**		**PNU3**		**Total**
≤750 g	175	81.8%	39	18.2%	0	0.0%	214
750-1000 g	74	70.5%	31	29.5%	0	0.0%	105
1001-1500 g	42	84.0%	8	16.0%	0	0.0%	50
1501-2500 g	19	76.0%	6	24.0%	0	0.0%	25
>2500 g	24	88.9%	3	11.1%	0	0.0%	27
Total	334	79.3%	87	20.7%	0	0.0%	421

PNU1, clinically defined pneumonia[3]; *PNU2*, pneumonia with specific laboratory findings[3]; *PNU3*, pneumonia in immunocompromised patients.[3]

Table 20. Distribution of specific sites of ventilator-associated pneumonia among level II/III NICUs by birthweight, 2006 through 2008

Birth weight category	**PNU1**		**PNU2**		**PNU3**		**Total**
≤750 g	75	72.8%	26	25.2%	2	1.9%	103
750-1000 g	53	81.5%	11	16.9%	1	1.5%	65
1001-1500 g	11	68.8%	5	31.3%	0	0.0%	16
1501-2500 g	8	80.0%	2	20.0%	0	0.0%	10
>2500 g	8	80.0%	2	20.0%	0	0.0%	10
Total	155	76.0%	46	22.5%	3	1.5%	204

PNU1, clinically defined pneumonia[3]; *PNU2*, pneumonia with specific laboratory findings[3]; *PNU3*, pneumonia in immunocompromised patients.[3]

days and patient days nearly doubled in each birthweight group, the device utilization ratios stayed essentially the same. This suggests that prevention efforts may be having the desired effects.[9,10]

Tables 13 to 20 were included to aid the reader in interpreting the device-associated infection rates data. One important use of these data is to aid understanding of the distribution of device-associated

Table 21. Pooled means and key percentiles of the distribution of post-procedure pneumonia rates* by operative procedure category, PA module, 2006 through 2008

PPP rate among inpatient procedures											
							Percentile				
Procedure code	Operative procedure description	No. of hospitals†		No. of procedures	No. of PPP	Pooled mean	10%	25%	50% (median)	75%	90%
AAA	Abdominal aortic aneurysm repair	17	(8)	566	8	1.41					
AMP	Limb amputation	6	(5)	618	0	0.00					
APPY	Appendix surgery	11	(8)	1971	2	0.10					
AVSD	Atrioventricular shunt for dialysis	7	(4)	254	0	0.00					
BILI	Bile duct, liver, or pancreatic surgery	6	(4)	288	1	0.35					
BRST	Breast surgery	8	(5)	593	0	0.00					
CARD	Cardiac surgery	40	(32)	5478	45	0.82	0.00	0.00	0.00	0.87	2.28
CBGB	Coronary bypass with chest and donor incisions	61	(52)	20,746	174	0.84	0.00	0.00	0.50	1.47	2.77
CBGC	Coronary bypass graft with chest incision	49	(20)	1423	17	1.19	0.00	0.00	0.00	1.54	2.94
CEA	Carotid endarterectomy	11	(5)	877	2	0.23					
CHOL	Gallbladder surgery	19	(15)	2900	7	0.24					
COLO	Colon surgery	55	(40)	7893	44	0.56	0.00	0.00	0.00	0.86	1.30
CRAN	Craniotomy	14	(12)	1093	10	0.91					
CSEC	Cesarean section	22		8730	2	0.02	0.00	0.00	0.00	0.00	0.00
FUSN	Spinal fusion	24	(22)	8826	11	0.12	0.00	0.00	0.00	0.20	0.38
FX	Open reduction of fracture	16	(14)	4004	9	0.22					
GAST	Gastric surgery	11	(8)	2468	3	0.12					
HER	Herniorrhaphy	17	(12)	2578	0	0.00					
HPRO	Hip prosthesis	104	(79)	16,479	28	0.17	0.00	0.00	0.00	0.00	0.42
HTP	Heart transplant	5	(1)	47	3	6.38					
HYST	Abdominal hysterectomy	68	(44)	8480	5	0.06	0.00	0.00	0.00	0.00	0.00
KPRO	Knee prosthesis	103	(78)	25,627	15	0.06	0.00	0.00	0.00	0.00	0.00
LAM	Laminectomy	17	(16)	7598	4	0.05					
NEPH	Kidney surgery	5	(2)	238	1	0.42					
OVRY	Ovarian surgery	6	(4)	898	0	0.00					
PACE	Pacemaker surgery	7	(5)	1591	0	0.00					
PRST	Prostate surgery	6	(2)	129	0	0.00					
PVBY	Peripheral vascular bypass surgery	13	(11)	1428	3	0.21					
REC	Rectal surgery	7	(3)	182	1	0.55					
RFUSN	Refusion of spine	10	(4)	153	0	0.00					
SB	Small bowel surgery	12	(6)	1027	8	0.78					
SPLE	Spleen surgery	6	(1)	71	2	2.82					
THOR	Thoracic surgery	6	(5)	571	6	1.05					
THYR	Thyroid and/or parathyroid surgery	6	(4)	351	1	0.28					
VHYS	Vaginal hysterectomy	37	(22)	3352	0	0.00	0.00	0.00	0.00	0.00	0.00
VSHN	Ventricular shunt	6	(5)	672	0	0.00					
XLAP	Exploratory abdominal surgery	11	(7)	1514	4	0.26					

PPP, post-procedure pneumonia.
*Per 100 operations.
†Number of hospitals meeting minimum requirements for percentile distributions if less than the total number of hospitals. If this number is <20, then percentile distributions are not calculated.

infections by type of reporting criterion. For example, most of the CLABSIs from adult and pediatric ICU and inpatient wards were identified using the most objective criterion (1); however for NICUs, fewer than two-thirds used this criterion. Similarly, the specific site of ventilator-associated pneumonia most frequently reported, regardless of location, was the clinical criterion (PNU1). However, in adult and pediatric locations,

Table 22. Pooled means and key percentiles of the distribution of SSI rates* by operative procedure and risk index categories, PA module, 2006 through 2008

Procedure code	Operative procedure description	Duration cutpoint, minutes	Risk index category	No. of hospitals†		No. of procedures	No. of SSI	Pooled mean	Percentiles				
									10%	25%	50% (median)	75%	90%
Inpatient procedures													
AAA	Abdominal aortic aneurysm repair	217	0, 1	41	(18)	1465	31	2.12					
AAA	Abdominal aortic aneurysm repair	217	2, 3	39	(6)	480	31	6.46					
AMP	Limb amputation	81	0, 1	15	(8)	560	7	1.25					
AMP	Limb amputation	81	2, 3	16	(8)	854	26	3.04					
APPY	Appendix surgery	81	0, 1	31	(22)	5211	60	1.15	0.00	0.00	0.60	1.23	2.76
APPY	Appendix surgery	81	2, 3	27	(9)	663	23	3.47					
AVSD	AV shunt for dialysis	112	0, 1, 2, 3	16	(8)	868	11	1.27					
BILI	Bile duct, liver or pancreatic surgery	321	0, 1	14	(7)	595	48	8.07					
BILI	Bile duct, liver or pancreatic surgery	321	2, 3	11	(4)	293	40	13.65					
BRST	Breast surgery	196	0	22	(9)	1478	14	0.95					
BRST	Breast surgery	196	1	21	(11)	1422	42	2.95					
BRST	Breast surgery	196	2, 3	15	(5)	236	15	6.36					
CARD	Cardiac surgery	306	0, 1	150	(124)	21,555	238	1.10	0.00	0.00	0.49	1.64	2.60
CARD	Cardiac surgery	306	2, 3	145	(83)	7130	131	1.84	0.00	0.00	1.24	3.25	4.71
CBGB	Coronary bypass with chest and donor incision	301	0	135	(4)	1738	6	0.35					
CBGB	Coronary bypass with chest and donor incision	301	1	292	(264)	91,007	2319	2.55	0.00	0.65	1.90	3.45	5.37
CBGB	Coronary bypass with chest and donor incision	301	2	285	(228)	30,204	1288	4.26	0.00	1.33	3.08	5.81	8.70
CBGB	Coronary bypass with chest and donor incision	301	3	48	(0)	106	9	8.49					
CBGC	Coronary bypass graft with chest incision	286	0, 1	246	(110)	8771	120	1.37	0.00	0.00	0.00	2.47	4.55
CBGC	Coronary bypass graft with chest incision	286	2, 3	218	(37)	2888	66	2.29	0.00	0.00	0.00	2.80	6.89
CEA	Carotid endarterectomy	124	0, 1, 2, 3	36	(26)	4536	15	0.33	0.00	0.00	0.00	0.50	1.12
CHOL	Gallbladder surgery	99	0	96	(61)	6481	15	0.23	0.00	0.00	0.00	0.00	0.86
CHOL	Gallbladder surgery	99	1	95	(60)	5726	35	0.61	0.00	0.00	0.00	0.97	2.06
CHOL	Gallbladder surgery	99	2, 3	92	(28)	2445	42	1.72	0.00	0.00	0.00	3.23	4.73
COLO	Colon surgery	187	0	278	(177)	17,126	683	3.99	0.00	1.58	3.49	5.56	8.73
COLO	Colon surgery	187	1	292	(235)	30,159	1686	5.59	0.00	2.06	4.48	7.43	11.16
COLO	Colon surgery	187	2	277	(182)	13,387	945	7.06	0.00	2.38	5.06	9.09	13.78
COLO	Colon surgery	187	3	207	(14)	1468	139	9.47					
CRAN	Craniotomy	225	0, 1	44	(37)	7902	170	2.15	0.00	0.00	1.51	2.62	6.37
CRAN	Craniotomy	225	2, 3	41	(18)	1761	82	4.66					
CSEC	Cesarean section	56	0	59	(54)	20,743	303	1.46	0.00	0.31	1.07	2.69	4.07
CSEC	Cesarean section	56	1	61	(50)	8995	219	2.43	0.00	0.00	1.82	4.32	6.45
CSEC	Cesarean section	56	2, 3	52	(15)	1256	48	3.82					
FUSN	Spinal fusion	239	0	113	(82)	20,059	140	0.70	0.00	0.00	0.24	1.04	1.84
FUSN	Spinal fusion	239	1	116	(83)	16,640	306	1.84	0.00	0.65	1.70	2.34	3.13
FUSN	Spinal fusion	239	2, 3	100	(52)	4511	187	4.15	0.00	1.64	3.35	5.66	7.11
FX	Open reduction of fracture	138	0	39	(25)	3600	40	1.11	0.00	0.00	0.00	1.13	2.43
FX	Open reduction of fracture	138	1	38	(30)	5629	100	1.78	0.00	0.83	1.60	2.51	4.55
FX	Open reduction of fracture	138	2, 3	36	(10)	1249	42	3.36					
GAST	Gastric surgery	160	0, 1	40	(29)	6350	109	1.72	0.00	0.70	1.21	2.57	3.58
GAST	Gastric surgery	160	2, 3	37	(20)	1821	77	4.23	0.00	1.04	2.30	5.00	8.16
HER	Herniorrhaphy	124	0	89	(32)	2852	21	0.74	0.00	0.00	0.00	1.08	1.91
HER	Herniorrhaphy	124	1	88	(38)	3348	81	2.42	0.00	0.00	1.02	3.15	5.63

HER	Herniorrhaphy	124	2, 3	72	(13)	1277	67	5.25					
HPRO	Hip prosthesis	120	0	627	(345)	49,576	334	0.67	0.00	0.00	0.00	0.96	2.09
HPRO	Hip prosthesis	120	1	665	(465)	65,046	938	1.44	0.00	0.00	0.90	2.09	3.51
HPRO	Hip prosthesis	120	2, 3	600	(204)	15,769	379	2.40	0.00	0.00	1.87	3.70	5.83
HTP	Heart transplant	377	0, 1, 2, 3	10	(6)	366	12	3.28					
HYST	Abdominal hysterectomy	143	0	348	(233)	33,477	367	1.10	0.00	0.00	0.32	1.66	2.89
HYST	Abdominal hysterectomy	143	1	334	(167)	16,822	370	2.20	0.00	0.00	1.61	3.19	6.06
HYST	Abdominal hysterectomy	143	2, 3	258	(55)	3779	153	4.05	0.00	0.00	3.41	4.86	7.21
KPRO	Knee prosthesis	119	0	494	(336)	70,675	409	0.58	0.00	0.00	0.00	0.68	1.50
KPRO	Knee prosthesis	119	1	518	(386)	79,653	786	0.99	0.00	0.00	0.48	1.39	2.33
KPRO	Knee prosthesis	119	2, 3	484	(236)	20,855	333	1.60	0.00	0.00	0.81	2.38	4.17
KTP	Kidney transplant	237	0, 1	10	(9)	1226	45	3.67					
KTP	Kidney transplant	237	2, 3	10	(4)	396	26	6.57					
LAM	Laminectomy	166	0	76	(69)	20,972	150	0.72	0.00	0.00	0.58	1.25	2.40
LAM	Laminectomy	166	1	77	(67)	15,054	166	1.10	0.00	0.00	1.04	2.20	3.77
LAM	Laminectomy	166	2, 3	76	(42)	4051	93	2.30	0.00	0.00	2.04	3.73	5.00
LTP	Liver transplant	414	0, 1	7	(3)	620	72	11.61					
LTP	Liver transplant	414	2, 3	6	(3)	204	41	20.10					
NECK	Neck surgery	363	0, 1	10	(2)	488	8	1.64					
NECK	Neck surgery	363	2, 3	7	(1)	114	13	11.40					
NEPH	Kidney surgery	257	0, 1	11	(7)	570	5	0.88					
NEPH	Kidney surgery	257	2, 3	9	(2)	111	5	4.50					
OVRY	Ovarian surgery	183	0, 1	14	(12)	2584	11	0.43					
OVRY	Ovarian surgery	183	2, 3	11	(3)	432	6	1.39					
PACE	Pacemaker surgery	73	0, 1, 2, 3	17	(10)	3403	15	0.44					
PRST	Prostate surgery	245	0, 1	14	(7)	895	8	0.89					
PRST	Prostate surgery	245	2, 3	8	(2)	138	4	2.90					
PVBY	Peripheral vascular bypass surgery	221	0	46	(4)	410	12	2.93					
PVBY	Peripheral vascular bypass surgery	221	1, 2, 3	56	(45)	5792	404	6.98	0.00	2.75	4.63	8.47	12.41
REC	Rectal surgery	252	0	16	(5)	346	12	3.47					
REC	Rectal surgery	252	1, 2	19	(7)	776	62	7.99					
REC	Rectal surgery	252	3	9	(1)	45	12	26.67					
RFUSN	Refusion of spine	310	0, 1	41	(14)	863	20	2.32					
RFUSN	Refusion of spine	310	2, 3	24	(2)	126	11	8.73					
SB	Small bowel surgery	192	0	29	(10)	843	29	3.44					
SB	Small bowel surgery	192	1, 2, 3	32	(17)	3378	228	6.75					
SPLE	Spleen surgery	217	0, 1, 2, 3	15	(3)	257	6	2.33					
THOR	Thoracic surgery	188	0, 1	15	(11)	1440	11	0.76					
THOR	Thoracic surgery	188	2, 3	14	(7)	539	11	2.04					
THYR	Thyroid and/or parathyroid surgery	150	0, 1, 2, 3	11	(8)	1168	3	0.26					
VHYS	Vaginal hysterectomy	133	0	158	(89)	12,413	90	0.73	0.00	0.00	0.00	0.92	2.07
VHYS	Vaginal hysterectomy	133	1, 2, 3	149	(70)	6456	75	1.16	0.00	0.00	0.00	1.79	3.05
VSHN	Ventricular shunt	79	0	23	(10)	867	35	4.04					
VSHN	Ventricular shunt	79	1, 2, 3	24	(17)	4270	253	5.93					
XLAP	Exploratory abdominal surgery	199	0, 1	29	(17)	3538	59	1.67					
XLAP	Exploratory abdominal surgery	199	2, 3	21	(6)	1561	44	2.82					
Outpatient procedures													
APPY	Appendix surgery	58	0, 1, 2, 3	8	(3)	233	2	0.86					
BRST	Breast surgery	122	0	10	(3)	944	3	0.32					
BRST	Breast surgery	122	1, 2, 3	7	(3)	659	7	1.06					

(Continued)

Table 22. (Continued)

Procedure code	Operative procedure description	Duration cutpoint, minutes	Risk index category	No. of hospitals[†]		No. of procedures	No. of SSI	Pooled mean	Percentiles				
									10%	25%	50% (median)	75%	90%
CHOL	Gallbladder surgery	65	0	71	(47)	5696	6	0.11	0.00	0.00	0.00	0.00	0.13
CHOL	Gallbladder surgery	65	1, 2, 3	71	(42)	4379	15	0.34	0.00	0.00	0.00	0.00	0.47
FX	Open reduction of fracture	105	0, 1, 2, 3	12	(6)	715	2	0.28					
HER	Herniorrhaphy	63	0, 1	99	(69)	10,305	47	0.46	0.00	0.00	0.00	0.23	1.15
HER	Herniorrhaphy	63	2, 3	72	(9)	685	9	1.31					
KPRO	Knee prosthesis	131	0, 1, 2, 3	7	(0)	16	0	0.00					
LAM	Laminectomy	95	0, 1, 2, 3	21	(10)	901	7	0.78					
VHYS	Vaginal hysterectomy	117	0, 1, 2, 3	5	(1)	44	0	0.00					

SSI, surgical site infection.
*Per 100 operations.
[†]Number of hospitals meeting minimum requirements for percentile distributions if less than the total number of hospitals. If this number is <20, then percentile distributions are not calculated.

Table 23. SSI rates* following coronary artery bypass graft procedure, by risk index category and specific site, PA module, 2006 through 2008

Infection site	Risk index category							
	0		1		2		3	
	No. SSI	Rate	No. SSI	Rate	No. SSI	Rate	No. SSI	Rate
Secondary (donor site)	**2**	**0.12**	**599**	**0.66**	**460**	**1.52**	**3**	**2.82**
Superficial incisional	2	0.12	464	0.51	342	1.13	3	2.82
Deep incisional	0	0.00	135	0.15	118	0.39	0	0.00
Primary (chest site)	**4**	**0.23**	**1720**	**1.89**	**828**	**2.74**	**6**	**5.67**
Superficial incisional	2	0.11	721	0.79	314	1.04	2	1.89
Deep incisional	1	0.06	527	0.58	266	0.88	2	1.89
Organ/space	1	0.06	472	0.52	248	0.82	2	1.89
Total	**6**	**0.35**	**2319**	**2.55**	**1288**	**4.26**	**9**	**8.49**

NOTE. Denominators for the risk categories are as follows: category 0, 1738; category 1, 91,007; category 2, 30,204; category 3, 106.
CBGB, coronary artery bypass graft with primary (chest) and secondary (donor) incisions.
*Per 100 operations.

nearly 40% of ventilator-associated pneumonias reported used the more rigorous criteria of PNU2 and PNU3. The specific site of catheter-associated UTI was equally reported between symptomatic UTI and asymptomatic bacteriuria. However, the distinction between symptomatic UTI and asymptomatic bacteriuria is often only the presence of fever, which can be difficult to attribute completely to infection versus other processes in critically ill patients. For this reason, beginning in 2009, the criteria for UTI have been modified to eliminate all asymptomatic bacteriuria except those few in which a secondary BSI was present.[4]

We assessed the potential impact of mandatory reporting on the pooled mean CLABSI rates for those types of ICUs required by law to report these infections in Colorado, Connecticut, Delaware, Illinois, Massachusetts, Maryland, New York, Oklahoma, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, and Washington, and found no consistent significant differences with or without these states' data.

In this second report of pooled mean PPP rates, we find that they remain very low, ranging from 0% for vaginal hysterectomy to 1.41% for abdominal aortic aneurysm repair procedures. Even though the volume of procedures and list of procedure types nearly doubled compared with the last report, these rates should still be considered provisional due to the limited number of pneumonia infections for most procedures.

The risk of SSI varies by procedure and risk category as reported previously (Table 22).[1] The cutpoint for the duration of procedure is the exact 75th percentile of that distribution shown in minutes and allows for a more precise determination of the duration factor when assigning the NNIS risk index level.

Compared with the last NHSN Report, these SSI rates were very similar or slightly lower. However, the groupings of the risk index categories have changed for many procedures, which has an impact on the SSI rates reported in Table 22. For example, the risk index categories for cesarean section were changed from 0 versus 1, 2, 3 to 0 versus 1 versus 2, 3. In addition, we assessed the potential impact of mandatory reporting on the SSI rates for those procedure types with required SSI reporting in Colorado, Massachusetts, New York, Pennsylvania, South Carolina, Tennessee, and Vermont, and found no consistent significant differences with or without these states' data. There was insufficient evidence to warrant further stratification by mandatory versus voluntary reporting status. 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, the changing proportion of data contributed by various types of facilities, and the effects of validation efforts by mandatory reporting states impact the rates and their distributions so that the best possible risk-adjusted comparative data may be provided in future reports.

If you would like to compare your hospital's rates and ratios with those in this report, you must first collect information from your hospital in accordance with the methods described for NHSN.[2-4] You should also 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 (>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 or their own data to guide local prevention strategies and other quality improvement efforts aimed at reducing the occurrence of infections as much as possible.

We 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.

References

1. Edwards JR, Peterson KD, Andrus ML, Dudeck MA, Pollock DA, Horan TC. National Healthcare Safety Network (NHSN) report, data summary for 2006 through 2007, issued November 2008. Am J Infect Control 2008;36:609–26.
2. Centers for Disease Control and Prevention. Outline for healthcare-associated infection surveillance. Available from: http://www.cdc.gov/ncidod/dhqp/pdf/surveillance/OutlineForHAISurveillance.pdf. Accessed October 5, 2009.
3. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting. Am J Infect Control 2008;35:309-32.
4. Centers for Disease Control and Prevention. NHSN manual: patient safety component protocols. Available from: http://www.cdc.gov/nhsn/library.html#psc. Accessed September 20, 2009.
5. Klevens RM, Edwards JR, Andrus ML, Peterson KD, Dudeck MA, Horan TC and NHSN participants in Outpatient Dialysis Surveillance Dialysis Surveillance Report: National Healthcare Safety Network (NHSN)—Data Summary for 2006. Semin Dialysis 2008;21:24-8.
6. 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.
7. Hidron AI, Edwards JR, Patel J, Horan TC, Sievert DM, Pollock DA, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006–2007. Infect Control Hosp Epidemiol 2008;29:996-1011.
8. Edwards JR, Peterson KD, Andrus MA, Tolson JS, Goulding JS, Dudeck MA, et al. National Healthcare Safety Network (NHSN) report, data summary for 2006, issued June 2007. Am J Infect Control 2007;35:290-301.

9. Centers for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter-related infections. Morb Mortal Weekly Rep 2002;51(RR-10):1-29.
10. Centers for Disease Control and Prevention. Guidelines for preventing healthcare–associated pneumonia, 2003: recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee. Morb Mortal Weekly Rep 2004;53(RR-3):1-23.

APPENDIX A: HOW TO CALCULATE A DEVICE-ASSOCIATED INFECTION RATE AND DEVICE UTILIZATION RATIO WITH DA MODULE DATA

Calculation of device-associated infection rate

Step 1: Decide on 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 (eg, the type of location or a birth-weight 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:

Device-associated infection rate=
number of device-associated infections
for an infection site$\times$1000
$\div$number of device-days.

Example: Central line-associated BSI rate per 1000 central line-days = number of central line-associated BSIs $\times$ 1000 $\div$ number of central line-days.

Calculation of DU ratio

Steps 1, 2, and 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:

DU ratio = number of device-days
$\div$ 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 (ie, $<$ 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 the rate 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 percentiles. Because the ventilator is a significant risk factor for pneumonia, you may want to limit the duration of ventilation whenever possible (ie, decrease unnecessary use) while at the same time optimize infection prevention strategies in patients for which ventilator use is required.