Health Care Quality Performance (HCQP) Program

HOSPITAL-ACQUIRED INFECTIONS AND PREVENTION ADVISORY SUBCOMMITTEE

8:00-9:00am, February 23, 2009
HEALTH, Room 401

Goals/Objectives
▪ To discuss the details related to data collection for 1st and 2nd round HAI measures

Voting Members		
✓ Utpala Bandy, MD	☐ Andrew Komensky, RN	✓ Lee Ann Quinn, RN, BS, CIC
☐ Margaret Cornell, MS, RN	✓ Pat Mastors	✓ Janet Robinson, RN, Med, CIC
✓ Robert Crausman, MD	☐ Leonard Mermel, DO, ScM	✓ Nancy Vallande, MSM, MT, CIC
✓ Marlene Fishman, MPH, CIC	✓ Kathleen O'Connell, RN	☐ Sam Viner-Brown, MS
✓ Julie Jefferson, RN, MPH, CIC	☐ Harold Picken, MD	☐ Gloria Williams, MS
✓ Diane Kitson-Clark, RN, MSN, CIC	☐ Aurora Pop-Vicas, MD	

Time	Topic/Notes
8:00 am	**Welcome & Meeting Objective** Rosa Baier, MPH – Rosa opened the meeting and reviewed the meeting objectives.
8:05 am	**Data Collection/Submission** Rosa Baier, MPH – Finalize 1st tier measures: • <u>Employee flu vaccine compliance</u>: ▪ The Subcommittee reviewed the existing HEALTH data collection forms (see handouts) and identified recommended edits, including: - Adding "employed by facility" (Y/N) - Eliminating "student" (Y/N) - Adding healthcare worker type: physician (DO, MD), nurse (LPN, RN), CNA, and other (including students) - Revising some wording to clarify "direct patient contact" and "vaccination at another facility" definitions, as well as ensure 6th grade reading level - Collecting vaccination/declination data by worker type (physician, nurse, CNA, other, and total) on the aggregate form

- The group discussed capturing the amount of patient contact, for example by asking the number of hours each healthcare worker works in the facility, but held off adding any additional fields to these initial revisions.
- Communication to the hospitals should occur as early as is feasible, and include the revised forms and any instructions/education needed. Hospitals will need to determine how to aggregate data across forms.
- **Action items**: Len, Sam, and Rosa will talk to John to ensure that the above recommendations do not affect HEALTH's ongoing analyses or ability to trend results longitudinally. If the form revisions are approved, they will make the changes and share them with the Subcommittee at the 3/9 meeting.

- ICU CLABSI:
  - At the previous meeting, the Subcommittee discussed the need to compare ICUs with others of the same type. This requires national comparison, vs. in-state comparison, and the use of the NHSN annual report. After the 2/9 meeting, Julie shared the most recent NHSN report (see handout).
  - The NHSN reports are updated annually, and have a significant lag time; the most recent report, from November 2008, reflects data from 2006-2007. Since the Subcommittee would like to begin state reporting with Quarter 1, 2009 data (available ~May 30, 2009), this means that the data and comparison will be from different time periods. The consumer reports will need to clearly indicate the differences.
  - **Action items**: Len, Sam, and Rosa will create a draft report format and share it with the Subcommittee for input at the 3/9 meeting.

– Continue discussion of 2nd tier measures:

- MRSA survey:
  - The discussion of the MRSA survey results was tabled.
  - **Action item**: Subcommittee members should come to the 3/9 meeting prepared to discuss and make recommendations about proposed measures for reporting.

8:45 am **Reporting Format(s)**
Rosa Baier, MPH

– **Action items**: Len, Sam, and Rosa will create draft report formats for the vaccination and ICU measures, and share them with the Subcommittee for input at the 3/9 meeting.

8:55 am **Action Items & Next Steps**
Rosa Baier, MPH

– Please see the above action items.

– Next meeting: 8-9am, March 9th, 2009, Beck Conference Room

FORM 1

INDIVIDUAL HEALTH CARE WORKER INFLUENZA VACCINATION ASSESSMENT

INSTRUCTIONS: This form **may** be used to record information on influenza vaccination of healthcare workers engaged in direct patient contact in your facility between September 1, 2007 and April 30, 2008 (influenza vaccination season). Information should be collected from each healthcare worker who is employed by you during that period of time. Information aggregated from the responses recorded on this form **or its equivalent** must be reported to the Rhode Island Department of Health between May 1 and June 30 (inclusive), in a manner prescribed by the Department. (The Department will specify modes of report transmission prior to May 1, 2008.)

FACILITY NAME: _____ **DATE**: ____/____/_____

Health Care Worker Name: _____ Student: YES ☐ NO ☐ **HCW ID:** _____

YES ☐ NO ☐ Were you engaged in direct patient contact (defined as any routinely anticipated face-to-face interaction with patients in a health care facility) at this facility between September 1, 2007 and April 30, 2008 (influenza vaccination season)?

IF YES, which one of the following statements best describes you?

☐ **RECEIVED** the influenza vaccine* **offered by THIS facility** for this year's influenza season (9/1/07 and 4/30/08)

☐ **RECEIVED** the influenza vaccine* **offered by ANOTHER facility** for this year's influenza season (9/1/07 and 4/30/08)

☐ **DID NOT RECEIVE** the influenza vaccine* for this year's influenza season (9/1/07 and 4/30/08)

☐ **UNKNOWN** whether or not he/she received the influenza vaccine* (offered by this or any other facility) for this year's influenza season (9/1/07 and 4/30/08)

Declination

If you **DID NOT RECEIVE** the influenza vaccine,* what is the **primary** reason? (**Please check one option, only.**)

☐ I have a medical exemption.**

☐ I do not think I am at risk for getting the flu – or – I do not think my patients are at risk of getting the flu from me.

☐ I do not want to put anything unnatural in my body.

☐ I do not think the vaccine works – or – I think the vaccine makes me sick.

☐ Other reason. Specify: _____

Health Care Worker Signature: _____

* Vaccine includes both Flu Mist and injection

** A health care worker (HCW) is considered exempt if:

a) The HCW produces a written document signed by a physician, physician assistant, or certified registered nurse practitioner, stating that the HCW has a medical exemption from the vaccine offered, or

b) A physician, physician assistant, or certified registered nurse practitioner acting for the health care facility in which the HCW is employed determines that the HCW has a medical exemption from the vaccine offered.

NB: ACIP Guidelines specify the following medical exemptions: 1) severe egg allergy; 2) hypersensitivity to thimerosal; 3) Hx of Guillian-Barre Syndrome within 6 wks of flu vaccination.

FORM 2

AGGREGATE HEALTH CARE WORKER INFLUENZA VACCINATION REPORT

INSTRUCTIONS: This form **may** be used to aggregate information on influenza vaccination of healthcare workers engaged in direct patient contact in your facility between September 1, 2007 and April 30, 2008 (influenza vaccination season). (The Rhode Island Department of Health will specify modes of report transmission prior to May 1, 2008.)

FACILITY NAME: _____ **DATE**: ____/____/_____

Facility Administrator: Name: _____ Phone #: (_____)_____-_____ Email: _____

Person Reporting: Name: _____ Title: _____ Phone #: (_____)_____-_____ Email: _____

Part A – Use for health care workers who ARE NOT students.

A [ ] = B+C+D+E **TOTAL NUMBER** of health care workers engaged in direct patient contact (defined as any routinely anticipated face-to-face interaction with patients in a health care facility) that worked in this facility between September 1, 2007 and April 30, 2008 (influenza vaccination season).

B [ ] Number of health care workers who **RECEIVED** the influenza vaccine* **offered by THIS facility** between 9/1/07 and 4/30/08

C [ ] Number of health care workers who **RECEIVED** the influenza vaccine* **offered by ANOTHER facility** for this year's influenza season between 9/1/07 and 4/30/08

D [ ] Number of health care workers who **DID NOT RECEIVE** the influenza vaccine* between 9/1/07 and 4/30/08

E [ ] = A - (B+C+D) Number of health care workers for whom it is **UNKNOWN** whether or not they received the influenza vaccine* between 9/1/07 and 4/30/08

Declinations

[Please attempt to categorize and count declinations using the following primary reasons for not getting vaccinated.]

	Count	Primary Reason for Declination
D1.	[ ]	I have a medical exemption.**
D2.	[ ]	I do not think I am at risk for getting the flu – or – I do not think my patients are at risk of getting the flu from me.
D3.	[ ]	I do not want to put anything unnatural in my body.
D4.	[ ]	I do not think the vaccine works – or – I think the vaccine makes me sick.
D5.	[ ]	Other reasons. Please specify the most common "other" reason:

_____

* Vaccine includes both Flu Mist and injection

** A health care worker (HCW) is considered exempt if:

a) The HCW produces a written document signed by a physician, physician assistant, or certified registered nurse practitioner, stating that the HCW has a medical exemption from the vaccine offered, or

b) A physician, physician assistant, or certified registered nurse practitioner acting for the health care facility in which the HCW is employed determines that the HCW has a medical exemption from the vaccine offered.

NB: ACIP Guidelines specify the following medical exemptions: 1) severe egg allergy; 2) hypersensitivity to thimerosal; 3) Hx of Guillian-Barre Syndrome within 6 wks of flu vaccination.

Part B – Use for health care workers who ARE students.

A ☐ = B+C+D+E **TOTAL NUMBER** of health care workers engaged in direct patient contact (defined as any routinely anticipated face-to-face interaction with patients in a health care facility) that worked in this facility between September 1, 2007 and April 30, 2008 (influenza vaccination season).

B ☐ Number of health care workers who **RECEIVED** the influenza vaccine* **offered by THIS facility** between 9/1/07 and 4/30/08

C ☐ Number of health care workers who **RECEIVED** the influenza vaccine* **offered by ANOTHER facility** for this year's influenza season between 9/1/07 and 4/30/08

D ☐ Number of health care workers who **DID NOT RECEIVE** the influenza vaccine* between 9/1/07 and 4/30/08

E ☐ = A - (B+C+D) Number of health care workers for whom it is **UNKNOWN** whether or not they received the influenza vaccine* between 9/1/07 and 4/30/08

Declinations

[Please attempt to categorize and count declinations using the following primary reasons for not getting vaccinated.]

Count	Primary Reason for Declination
D1. ☐	I have a medical exemption.**
D2. ☐	I do not think I am at risk for getting the flu – or – I do not think my patients are at risk of getting the flu from me.
D3. ☐	I do not want to put anything unnatural in my body.
D4. ☐	I do not think the vaccine works – or – I think the vaccine makes me sick.
D5. ☐	Other reasons. Please specify the most common "other" reason:

_____

* Vaccine includes both Flu Mist and injection

** A health care worker (HCW) is considered exempt if:

a) The HCW produces a written document signed by a physician, physician assistant, or certified registered nurse practitioner, stating that the HCW has a medical exemption from the vaccine offered, or

b) A physician, physician assistant, or certified registered nurse practitioner acting for the health care facility in which the HCW is employed determines that the HCW has a medical exemption from the vaccine offered.

NB: ACIP Guidelines specify the following medical exemptions: 1) severe egg allergy; 2) hypersensitivity to thimerosal; 3) Hx of Guillian-Barre Syndrome within 6 wks of flu vaccination.

AJIC major articles

National Healthcare Safety Network (NHSN) Report, data summary for 2006 through 2007, issued November 2008

Jonathan R. Edwards, MStat, Kelly D. Peterson, BBA, Mary L. Andrus, BA, RN, CIC, Margaret A. Dudeck, MPH, Daniel A. Pollock, MD, Teresa C. Horan, MPH, and the National Healthcare Safety Network Facilities
Atlanta, Georgia

This report is a summary of device-associated and procedure-associated module data collected and reported by hospitals participating in the National Healthcare Safety Network (NHSN) from January 2006 through December 2007 as reported to the NHSN by March 24, 2008. This report updates previously published device-associated module data from NHSN and surgical site infection (SSI) rate data from the National Nosocomial Infections Surveillance (NNIS) system.[1,2]

The NHSN was established in 2005 to integrate and supersede 3 legacy surveillance systems at the Centers for Disease Control and Prevention (CDC): the 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;
- Discovery of HAI trends;
- Facilitation of inter- and intrahospital comparisons with risk-adjusted data that can be used for local quality improvement activities, and
- Assistance for facilities in developing surveillance and analysis methods that permit timely recognition of patient safety problems and prompt intervention with appropriate measures.

Identity of all NHSN facilities is held confidential by the CDC in accordance with sections 304, 306, and 308(d) of the Public Health Service Act (42 USC 242b, 242 K, and 242m(d)).

METHODS

The NHSN has both Patient Safety and Healthcare Personnel Safety surveillance components. Within the Patient Safety Component, data are collected using standardized methods and definitions[3,4] and are grouped into specific module protocols[5] as follows:

- Device-associated: see section below;
- Procedure-associated: see section below; and
- Medication-associated: for certain locations, facilities choose to report susceptibility data for selected organisms and/or antimicrobial use data for selected agents.

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.[4] Although the device-associated module may also be used by facilities other than hospitals, including outpatient dialysis centers, this report

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

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0196-6553/$0.00

This is a US government work. There are no restrictions on its use.

doi:10.1016/j.ajic.2008.08.001

Table 1. NHSN hospitals contributing data used in this report

Hospital type	N (%)
Children's	18 (2.9)
General, including acute, trauma, and teaching	560 (90.1)
Military	5 (0.8)
Oncology	3 (0.5)
Orthopedic	1 (0.2)
Veterans Affairs	28 (4.5)
Women's	3 (0.5)
Women's and children's	3 (0.5)
Total	621 (100)

focuses only on device-associated module data reported by hospitals. A report of data from this module for outpatient dialysis centers was published separately.[6] Data from the medication-associated module will be published in a separate report.

Device-associated module

Infection preventionists (IPs), formerly called *infection control professionals*, may choose to collect data on central line-associated primary bloodstream infections (BSIs), ventilator-associated pneumonias, or urinary catheter-associated urinary tract infections (UTI) that occur in patients staying in a patient care location such as an intensive care unit (ICU), specialty care area, or ward. In the NHSN, these locations are further characterized according to patient population: adults or children (in Tables, pediatric 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.

Procedure-associated module

IPs select from the NHSN operative procedure category list those in- and/or outpatient procedures for which they wish 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, wound class, and American Society of Anesthesiology (ASA) score.[5] Unlike the NNIS system, the NHSN operative procedure list does not include "catch all" procedure categories, such as "OCVS, other cardiovascular."

RESULTS

There were 923 hospitals enrolled in the NHSN at the end of 2007, of which 646 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 621 hospitals had reported at least denominator data in 2006 and/or 2007. Characteristics of these 621 NHSN hospitals from 45 states and the District of Columbia that contributed data for this report are shown in Tables 1 and 2. For the device-associated module where data volume was sufficient for this second report, we tabulated device-associated infection rates and device utilization (DU) ratios for January 2006 through December 2007 (Tables 3-12). Data on select attributes of the device-associated infections are provided in Tables 13 to 20. For the procedure-associated module where sufficient data existed, we tabulated procedure-associated infection rates for this same period (Tables 21-24).

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 10 different locations of a given type. For the percentile distributions, data from at least 20 different locations are 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 locations contributing data varies in the Tables. The central line-associated BSI (CLABSI) rates in Tables 3 and 4 exclude all BSIs that were reported using criterion 2b or 3b of the definition because these criteria were discontinued in January 2008 and the rates in Tables 3 and 4 will be incorporated into the NHSN reporting tool for comparative purposes.

Seven new locations—pediatric medical ICU, neurologic ICU, adult step down unit, rehabilitation ward, surgical ward, bone marrow transplant specialty care area, and hematology/oncology specialty care area—had sufficient data to be included in this report. The number of locations that were neurologic ICU, pediatric medical ICU, rehabilitation ward, or surgical ward was not adequate to provide distributions of any infection rates and DU ratios. For burn ICU and adult step down unit, there were insufficient data for ventilator-associated pneumonia and catheter-associated UTI rate and corresponding DU ratio distributions.

The data for adult combined medical/surgical ICUs were split into 2 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

Table 2. Bed size categories of NHSN contributing hospitals

	Bed size category				
	≤200	201-500	501-1000	>1000	
Hospital type	**N (%)**	**N (%)**	**N (%)**	**N (%)**	**Total**
Major teaching	25 (4.0)	83 (13.4)	64 (10.3)	2 (0.3)	174 (28.0)
Graduate teaching	21 (3.4)	53 (8.5)	13 (2.1)	0 (0.0)	87 (14.0)
Limited teaching	27 (4.4)	24 (3.8)	9 (1.5)	0 (0.0)	60 (9.7)
Nonteaching	200 (32.2)	90 (14.5)	10 (1.6)	0 (0.0)	300 (48.3)
Total	273 (44.0)	250 (40.2)	96 (15.5)	2 (0.3)	621(100)

NOTE. Major: Hospital is an important part of the teaching program of a medical school and the majority of medical students rotates 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 only to a limited extent.

teaching program of a medical school and the majority of medical students rotates through multiple clinical services (see also footnote to Table 2).

For the device-associated module, in non-NICU non-SCA 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.[7] DU may also serve as a marker for severity of illness of patients, that is, patients' intrinsic susceptibility to infection.

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 device-associated module, device-days consist of the total number of central line-days, umbilical catheter-days, or ventilator-days. Each of the analyses of NICU data excluded rates or DU ratios for units 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. Although the percentile distribution of the rates is provided, for some birth-weight categories the number of umbilical catheter-associated BSI and ventilator-associated pneumonias and their corresponding device-days is still small, and the data should be considered provisional.

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, and clinical sepsis is included as a valid BSI event for neonates in NICU. For some of the patient care locations in these Tables, the number of CLABSI does not exactly match those shown in the rates Tables because of an omission in the business logic in an early version of the NHSN Web interface. A total of 33 device-associated laboratory-confirmed BSIs for adult and pediatric ICU/wards did not have a criterion reported; the same was true for 5 of these infections in level III NICUs, and 1 in level II/III NICUs.

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

Tables 22 to 24 update and augment previously published SSI rates by procedure type, and NNIS risk index categories are new for this report as well.[2] A hospital's procedure-associated module data were excluded from the pool if the hospital did not report at least 20 NHSN operative procedures. For inclusion in these Tables, the pooled mean infection rates required data from at least 10 different hospitals. For the percentile distributions, data from at least 20 different hospitals are required. Ten new procedures—AAA, AVSD, BILI, BRST, CEA, PACE, PVBY, RFUSN, outpatient HER, and outpatient LAM—had sufficient data to be included in this report (see Table 22 for description and data).

DISCUSSION

The composition of hospitals reporting to NHSN has changed since the first report published over a year ago. As reflected in the hospital characteristics shown in Tables 1 and 2, there has been a disproportionately large influx of smaller hospitals. This change is likely due to 2 reasons: (1) New York, South Carolina, and Vermont had mandatory HAI reporting laws that required data to be reported through the NHSN to their respective responsible state agencies, and (2) enrollment in the NHSN was opened to all hospitals regardless of size in June 2007. As more states elect to use NHSN as their system for meeting mandatory HAI reporting requirements and as enrollment is opened to more types of facilities, eg, long-term acute

Table 3. Pooled means and key percentiles of the distribution of central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2006 through 2007

Central line-associated BSI rate*					Percentile				
Type of location	No. of locations	No. of CLABSI	Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	22	239	42,452	5.6	0.0	1.5	3.8	8.2	13.5
Coronary	121	373	181,079	2.1	0.0	0.0	1.3	2.8	5.3
Surgical cardiothoracic	97	397	275,194	1.4	0.0	0.0	1.2	1.9	3.4
Medical	144	1073	454,839	2.4	0.0	0.6	1.9	3.6	5.3
Medical/surgical, major teaching	104	692	342,214	2.0	0.0	0.5	1.5	3.0	4.2
Medical/surgical, all others	343	972	662,489	1.5	0.0	0.0	0.6	2.0	3.6
Pediatric medical/surgical	71	404	140,848	2.9	0.0	0.0	2.1	3.8	6.0
Pediatric medical	10	6	6256	1.0					
Neurologic	15	31	25,440	1.2					
Neurosurgical	39	173	68,550	2.5	0.0	0.0	1.9	3.8	6.2
Surgical	128	881	383,126	2.3	0.0	0.5	1.7	3.1	5.1
Trauma	32	435	107,620	4.0	0.3	1.5	4.0	5.7	7.7
Inpatient wards									
Adult step down unit (postcritical care)	24	61	24,981	2.4	0.0	0.0	0.7	2.7	3.5
Medical	40	111	60,257	1.8	0.0	0.0	0.0	2.2	3.4
Medical/surgical	82	169	132,133	1.3	0.0	0.0	0.0	1.6	4.0
Rehabilitation	11	2	3705	0.5					
Surgical	18	40	24,254	1.6					

Central line utilization ratio†					Percentile				
Type of location	No. of locations	Central line-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	24	42,452	72,329	0.59	0.24	0.34	0.52	0.71	0.82
Coronary	122	181,079	453,850	0.40	0.17	0.26	0.37	0.50	0.61
Surgical cardiothoracic	99	275,194	382,960	0.72	0.48	0.60	0.75	0.88	0.93
Medical	149	454,839	785,602	0.58	0.27	0.42	0.56	0.68	0.77
Medical/surgical, major teaching	104	342,214	581,286	0.59	0.37	0.46	0.58	0.71	0.75
Medical/surgical, all others	362	662,489	1,428,609	0.46	0.14	0.27	0.42	0.56	0.67
Pediatric medical/surgical	75	140,848	303,879	0.46	0.21	0.30	0.40	0.52	0.61
Pediatric medical	10	6256	16,569	0.38					
Neurologic	15	25,440	59,027	0.43					
Neurosurgical	39	68,550	154,242	0.44	0.26	0.36	0.46	0.60	0.70
Surgical	128	383,126	624,986	0.61	0.39	0.50	0.62	0.69	0.76
Trauma	32	107,620	166,487	0.65	0.51	0.56	0.64	0.71	0.80
Inpatient wards									
Adult step down unit (postcritical care)	27	24,981	97,615	0.26	0.03	0.09	0.21	0.33	0.46
Medical	40	60,257	256,098	0.24	0.07	0.14	0.18	0.27	0.57
Medical/surgical	92	132,133	638,229	0.21	0.03	0.07	0.11	0.22	0.35
Rehabilitation	11	3705	42,061	0.09					
Surgical	18	24,254	97,235	0.25					

NOTE. See Horan et al[4] for criteria.

$* = \frac{\text{Number of CLABSI}}{\text{Number of central line-days}} \times 100$

$\dagger = \frac{\text{Number of central line-days}}{\text{Number of CLABSI}}$

BSI, bloodstream infection including criteria 1 and 2a only; *CLABSI*, central line-associated BSI.

care and ambulatory surgery centers, we expect to have a more diverse group of health care facilities reporting in the future.

Comparisons of these data to those of the same locations from the last NHSN Report reveal several changes. As noted in the results, all CLABSI rates exclude BSIs reported using criterion 2b or 3b because of a recent change in the BSI definition.[8] This allows current hospital CLABSI rates collected using the changed BSI definition to be compared directly with

Table 4. Pooled means and key percentiles of the distribution of permanent central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2006 through 2007

Permanent central line-associated BSI rate*					Percentile				
Type of location	No. of locations	No. of PCLAB	Permanent central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Specialty care area									
Bone marrow transplant	11	110	28,251	3.9					
Hematology/oncology	10	44	25,740	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									
Bone marrow transplant	11	28,251	42,459	0.67					
Hematology/oncology	10	25,740	69,487	0.37					

NOTE. See Horan et al[4] for criteria.

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

$\dagger = \frac{\text{Number of permernent central line-days}}{\text{Number of patient-days}}$

BSI, bloodstream infection including criteria 1 and 2a only; *PCLAB*, permanent central line-associated BSI.

the aggregate data included in this report. Another important change is the differing composition of reporting hospitals, which is apparent in the nearly 3.5-fold increase in the number of medical/surgical ICUs from non-major teaching hospitals reporting CLABSI rates. In this type of ICU, the pooled mean CLABSI rates were reduced from 2.2 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 be better able to characterize the risk of device-associated infections among these patients.

In this report, most of the device-associated rates in NICUs were lower compared with the previous report. However, although the number of device-days and patient-days nearly tripled in each birth-weight 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 allow comparisons of past CLABSI rate data that included BSIs reported using criterion 2b or 3b. For example, to calculate the CLABSI rate for medical units including those BSIs reported with criteria 2b, one would simply need to add the number of laboratory-confirmed BSIs under criterion 2b for medical ICUs in Table 13 (ie, 164) to the number of CLABSIs in Table 3 for medical ICUs (1073) and divide this sum by the corresponding central line-days and multiply by 1000. Another use is to understand better the distribution of device-associated 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 half 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, nearly 40% of ventilator-associated pneumonias reported used the more rigorous criteria of PNU2 and PNU3. The specific site of catheter-associated UTI most frequently reported was symptomatic UTI. However, the distinction between this type of 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.

We assessed the potential impact of mandatory reporting on the pooled mean CLABSI rates for those types of ICUs required by New York, South Carolina, or Vermont and found no significant differences with or without these states' data.

In this first report of pooled mean PPP rates, we find that they are very low, ranging from 0% for vaginal

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 2007

Urinary catheter-associated UTI rate*					Percentile				
Type of location	No. of locations	No. of CAUTI	Urinary catheter-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	16	217	28,326	7.7					
Coronary	56	636	143,926	4.4	0.6	2.7	3.8	6.1	8.5
Surgical cardiothoracic	48	506	156,199	3.2	0.0	1.6	2.6	4.1	6.1
Medical	68	1419	347,465	4.1	0.6	1.9	3.7	5.5	7.9
Medical/surgical, major teaching	59	981	299,628	3.3	0.7	1.7	2.9	4.3	6.2
Medical/surgical, all others	130	1603	514,552	3.1	0.0	1.0	2.6	4.3	6.5
Pediatric medical/surgical	37	222	44,542	5.0	0.0	0.0	3.0	6.6	9.8
Neurosurgical	20	485	71,658	6.8	0.4	3.3	6.5	8.1	10.5
Surgical	65	1145	282,600	4.1	0.4	1.5	3.1	4.9	9.2
Trauma	21	624	109,849	5.7	1.8	3.5	5.7	7.1	7.5
Inpatient wards									
Adult step down unit (postcritical care)	20	109	23,430	4.7					
Medical	20	220	38,316	5.7	0.0	1.6	4.2	7.7	8.5
Medical/surgical	63	341	68,758	5.0	0.0	0.6	3.4	7.2	9.2
Rehabilitation	13	98	5821	16.8					
Surgical	11	97	18,573	5.2					

Urinary catheter utilization†					Percentile				
Type of location	No. of locations	Urinary catheter-days	Patient days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	16	28,326	43,317	0.65					
Coronary	56	143,926	242,052	0.59	0.31	0.48	0.62	0.70	0.78
Surgical cardiothoracic	49	156,199	196,708	0.79	0.49	0.71	0.83	0.88	0.95
Medical	68	347,465	458,606	0.76	0.63	0.71	0.76	0.83	0.87
Medical/surgical, major teaching	59	299,628	379,416	0.79	0.63	0.76	0.80	0.85	0.91
Medical/surgical, all others	132	514,552	715,845	0.72	0.54	0.67	0.79	0.84	0.89
Pediatric medical/surgical	39	44,542	158,304	0.28	0.13	0.18	0.26	0.33	0.41
Neurosurgical	20	71,658	88,576	0.81	0.69	0.77	0.82	0.88	0.91
Surgical	65	282,600	349,008	0.81	0.64	0.77	0.83	0.88	0.94
Trauma	21	109,849	121,015	0.91	0.82	0.88	0.90	0.94	0.96
Inpatient wards									
Adult step down unit (postcritical care)	20	23,430	68,283	0.34					
Medical	20	38,316	148,890	0.26	0.12	0.17	0.24	0.28	0.43
Medical/surgical	69	68,758	309,870	0.22	0.11	0.16	0.22	0.27	0.30
Rehabilitation	13	5821	48,151	0.12					
Surgical	11	18,573	59,977	0.31					

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

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

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

hysterectomy to 1.32% for abdominal aortic aneurysm repair procedures. Because of the limited number of pneumonia infections for most procedures, these data should be considered provisional.

The risk of SSI varies by procedure and risk category as reported previously.[2] However, for selected procedures where the use of a laparoscope had been shown to lower SSI risk, there were insufficient data at this time to differentiate risk beyond the basic 3 factors of the NNIS risk index. Thus, SSI rates by procedure and risk category were combined into a single Table (Table 22). Furthermore, the cut point for the duration of procedure is now shown in minutes and is the exact 75th percentile of that distribution. Previously, the cut point was the minutes rounded to the nearest whole number of hours. We believe this change provides a more

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 2007

Ventilator-associated PNEU rate*					Percentile				
Type of location	No. of locations	No. of VAP	Ventilator-days	Pooled mean	10%	25%	50% (median)	75%	90%
Burn	19	243	22,765	10.7					
Coronary	72	211	83,446	2.5	0.0	0.0	1.2	3.3	4.9
Surgical cardiothoracic	70	523	112,400	4.7	0.0	1.4	3.4	7.1	13.1
Medical	93	656	257,631	2.5	0.0	1.0	1.9	4.0	6.1
Medical/surgical, major teaching	79	692	209,617	3.3	0.5	1.3	2.3	4.1	7.7
Medical/surgical, all others	187	808	344,085	2.3	0.0	0.0	1.5	3.4	5.7
Pediatric medical/surgical	50	176	85,809	2.1	0.0	0.0	0.7	3.2	4.1
Neurologic	11	101	14,180	7.1					
Neurosurgical	26	263	40,748	6.5	0.0	3.2	4.5	6.5	11.7
Surgical	87	954	178,405	5.3	0.7	2.1	4.5	7.1	10.5
Trauma	25	719	76,926	9.3	0.5	2.7	8.3	11.1	16.7
Inpatient wards									
Adult step down unit (postcritical care)	15	23	5021	4.6					

Ventilator utilization ratio†					Percentile				
Type of location	No. of locations	Ventilator-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
Critical care units									
Burn	19	22,765	55,285	0.41					
Coronary	74	83,446	304,885	0.27	0.09	0.14	0.26	0.32	0.43
Surgical cardiothoracic	73	112,400	290,898	0.39	0.18	0.24	0.35	0.45	0.53
Medical	94	257,631	573,167	0.45	0.23	0.32	0.45	0.56	0.63
Medical/surgical, major teaching	81	209,617	471,619	0.44	0.22	0.31	0.44	0.58	0.65
Medical/surgical, all others	207	344,085	990,010	0.35	0.11	0.22	0.33	0.43	0.53
Pediatric medical/surgical	54	85,809	206,380	0.42	0.14	0.25	0.37	0.49	0.55
Neurologic	11	14,180	36,669	0.39					
Neurosurgical	26	40,748	107,095	0.38	0.25	0.29	0.36	0.44	0.48
Surgical	87	178,405	437,594	0.41	0.21	0.29	0.40	0.50	0.59
Trauma	25	76,926	131,941	0.58	0.41	0.49	0.56	0.65	0.76
Inpatient wards									
Adult step down unit (postcritical care)	15	5021	68,430	0.07					

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

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

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

accurate and consistent determination of the NNIS risk index level.

When compared with the last NNIS report, these SSI rates were very similar or slightly lower. However, the number of SSI reported in Table 24 is substantially less than its counterpart in the last NNIS report and should be interpreted with caution. In addition, we assessed the potential impact of mandatory reporting on the SSI rates for colon surgery (required by New York), coronary artery bypass graft (required by New York and South Carolina), abdominal hysterectomy (required by South Carolina and Vermont), and vaginal hysterectomy (required by South Carolina). There was insufficient evidence to warrant further stratification by mandatory versus voluntary reporting status. As more and diverse types of facilities participate in the 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 them, and the effects of validation efforts by mandatory reporting states impact the rates and their distributions to provide the best possible risk-adjusted comparative data 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

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 2007

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 g	82	225	60,850	3.7	0.0	0.0	2.3	4.9	9.0
751-1000 g	84	185	55,445	3.3	0.0	0.0	2.4	4.5	7.3
1001-1500 g	83	144	55,874	2.6	0.0	0.0	1.6	3.6	6.1
1501-2500 g	71	105	44,402	2.4	0.0	0.0	1.1	3.3	6.0
>2500 g	61	87	42,611	2.0	0.0	0.0	0.0	3.1	5.4

Central line utilization ratio†					Percentile				
Birth-weight category	No. of locations	Central line-days	Patient-days	Pooled Mean	10%	25%	50% (median)	75%	90%
≤750 g	88	60,850	177,542	0.34	0.19	0.29	0.35	0.44	0.53
751-1000 g	91	55,445	175,397	0.32	0.18	0.22	0.31	0.40	0.51
1001-1500 g	94	55,874	238,102	0.23	0.09	0.16	0.22	0.31	0.38
1501-2500 g	93	44,402	273,739	0.16	0.03	0.07	0.12	0.20	0.33
>2500 g	87	42,611	213,322	0.20	0.05	0.07	0.13	0.19	0.30

NOTE. See Horan et al[4] for criteria.

BSI, bloodstream infection including criteria 1, 2a, and 3a only; *CLABSI*, central line-associated BSI.

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

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

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 2007

Umbilical catheter-associated BSI rate*					Percentile				
Birth-weight category	No. of locations	No. of UCAB	Umbilical catheter-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	71	79	16,762	4.7	0.0	0.0	0.0	7.7	14.7
751-1000 g	70	39	15,034	2.6	0.0	0.0	0.0	4.1	8.8
1001-1500 g	67	32	16,681	1.9	0.0	0.0	0.0	2.8	7.8
1501-2500 g	62	15	16,321	0.9	0.0	0.0	0.0	0.0	3.0
>2500 g	68	22	22,978	1.0	0.0	0.0	0.0	0.0	3.7

Umbilical catheter utilization ratio†					Percentile				
Birth-weight category	No. of locations	Umbilical catheter-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	85	16,762	155,133	0.11	0.05	0.08	0.12	0.20	0.28
751-1000 g	87	15,034	151,822	0.10	0.05	0.06	0.11	0.18	0.24
1001-1500 g	90	16,681	207,079	0.08	0.03	0.05	0.08	0.14	0.19
1501-2500 g	92	16,321	250,858	0.07	0.02	0.03	0.06	0.10	0.14
>2500 g	89	22,978	219,705	0.10	0.05	0.06	0.09	0.15	0.20

NOTE. See Horan et al[4] for criteria.

BSI, bloodstream infection including criteria 1, 2a and 3a only; *UCAB*, umbilical catheter-associated BSI.

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

†$\frac{\text{Number of umbilical catheter-days}}{\text{Number of patient-days}}$

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 2007

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 g	44	112	31,202	3.6	0.0	0.0	1.2	5.7	9.2
751-1000 g	48	83	25,852	3.2	0.0	0.0	2.5	5.5	10.7
1001-1500 g	49	63	30,026	2.1	0.0	0.0	0.2	3.1	7.7
1501-2500 g	40	26	21,431	1.2	0.0	0.0	0.0	2.1	4.0
>2500 g	35	21	21,031	1.0	0.0	0.0	0.0	0.9	2.9

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 g	48	31,202	73,972	0.42	0.25	0.32	0.37	0.47	0.56
751-1000 g	55	25,852	71,974	0.36	0.19	0.26	0.34	0.46	0.58
1001-1500 g	63	30,026	104,546	0.29	0.11	0.17	0.25	0.33	0.39
1501-2500 g	61	21,431	116,442	0.18	0.03	0.06	0.12	0.18	0.31
> 2500 g	55	21,031	85,126	0.25	0.04	0.07	0.14	0.23	0.31

See Horan et al[4] for criteria.

BSI, bloodstream infection including criteria 1, 2a and 3a only; *CLABSI*, central line-associated BSI.

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

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

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 2007

Umbilical catheter-associated BSI rate*					Percentile				
Birth-weight category	No. of locations	No. of UCAB	Umbilical catheter-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	36	56	9418	4.7	0.0	0.0	5.3	8.1	16.8
751-1000 g	37	17	8696	2.6	0.0	0.0	0.0	4.2	12.4
1001-1500 g	38	12	8957	1.9	0.0	0.0	0.0	0.0	5.9
1501-2500 g	38	6	8806	0.9	0.0	0.0	0.0	0.0	1.9
>2500 g	40	9	13,055	1.0	0.0	0.0	0.0	0.0	0.0

Umbilical catheter utilization ratio†					Percentile				
Birth-weight category	No. of locations	Umbilical catheter-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	45	9418	61,589	0.15	0.07	0.11	0.19	0.27	0.31
751-1000 g	54	8696	66,884	0.13	0.07	0.10	0.15	0.19	0.25
1001-1500 g	62	8957	97,690	0.09	0.04	0.06	0.09	0.13	0.16
1501-2500 g	60	8806	123,858	0.07	0.03	0.05	0.07	0.10	0.12
>2500 g	62	13,055	97,878	0.13	0.03	0.06	0.10	0.15	0.23

See Horan et al[4] for criteria.

BSI, bloodstream infection including criteria 1, 2a and 3a only; *UCAB*, umbilical catheter-associated BSI.

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

†$\frac{\text{Number of umbilical catheter-days}}{\text{Number of patient-days}}$

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 2007

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 g	49	144	55,554	2.6	0.0	0.0	0.9	3.3	7.5
751-1000 g	50	72	33,988	2.1	0.0	0.0	0.0	3.7	9.0
1001-1500 g	48	32	22,052	1.5	0.0	0.0	0.0	2.1	5.2
1501-2500 g	38	17	16,296	1.0	0.0	0.0	0.0	1.4	5.7
>2500 g	43	17	19,922	0.9	0.0	0.0	0.0	0.0	0.7

Ventilator utilization ratio†					Percentile				
Birth-weight category	No. of locations	Ventilator-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	51	55,554	111,140	0.50	0.34	0.44	0.50	0.65	0.86
751-1000 g	52	33,988	105,836	0.32	0.12	0.21	0.30	0.42	0.61
1001-1500 g	52	22,052	146,551	0.15	0.07	0.09	0.14	0.21	0.36
1501-2500 g	54	16,296	177,783	0.09	0.02	0.04	0.06	0.15	0.28
> 2500 g	53	19,922	139,997	0.14	0.04	0.05	0.11	0.19	0.24

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

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

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

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 2007

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 g	35	67	20,088	3.3	0.0	0.0	1.4	5.3	14.1
751-1000 g	32	47	13,061	3.6	0.0	0.0	1.0	5.7	8.8
1001-1500 g	31	11	7794	1.4	0.0	0.0	0.0	0.5	4.6
1501-2500 g	27	6	6007	1.0	0.0	0.0	0.0	0.0	0.6
>2500 g	30	7	8704	0.8	0.0	0.0	0.0	0.0	2.3

Ventilator utilization ratio†					Percentile				
Birth-weight category	No. of locations	Ventilator-days	Patient-days	Pooled mean	10%	25%	50% (median)	75%	90%
≤750 g	36	20,088	42,535	0.47	0.31	0.41	0.52	0.59	0.75
751-1000 g	39	13,061	42,684	0.31	0.15	0.21	0.31	0.40	0.47
1001-1500 g	41	7794	60,595	0.13	0.05	0.07	0.10	0.14	0.25
1501-2500 g	44	6007	81,468	0.07	0.01	0.03	0.04	0.09	0.20
>2500 g	43	8704	60,817	0.14	0.03	0.06	0.10	0.15	0.26

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

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

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

Table 13. Distribution of criteria for central line-associated laboratory confirmed BSI by location, 2006 through 2007

	LCBI						
Type of location	**Criterion 1**		**Criterion 2a**		**Criterion 2b**		**Total**
Critical care units	N	%	N	%	N	%	N
Burn	216	84.0	23	8.9	18	7.0	257
Coronary	292	66.5	79	18.0	68	15.5	439
Medical	905	73.6	160	13.0	164	13.3	1229
Medical/surgical, major teaching	520	62.4	168	20.1	146	17.5	834
Medical/surgical, all others	682	57.2	286	24.0	225	18.9	1193
Neurologic	25	62.5	6	15.0	9	22.5	40
Neurosurgical	136	59.4	36	15.7	57	24.9	229
Pediatric medical	6	75.0	0	0.0	2	25.0	8
Pediatric medical/surgical	343	59.4	58	10.1	173	30.0	577
Surgical cardiothoracic	305	70.0	86	19.7	45	10.3	436
Surgical	716	69.9	160	15.6	148	14.5	1024
Trauma	384	81.4	48	10.2	40	8.5	472
Inpatient wards							
Adult step down unit (postcritical care)	40	62.5	18	28.1	6	9.4	64
Medical	93	79.5	18	15.4	6	5.1	117
Medical/surgical	131	71.2	38	20.7	15	8.2	184
Rehabilitation	0	0.0	2	66.7	1	33.3	3
Surgical	27	58.7	13	28.3	6	13.0	46
Total	4821	67.4	1199	16.8	1129	15.8	7152

NOTE. See Horan et al[4] for criteria.
BSI, bloodstream infection; *LCBI*, laboratory-confirmed BSI.

Table 14. Distribution of criteria for permanent central line-associated laboratory confirmed BSI by location, 2006 through 2007

	LCBI						
Type of location	**Criterion 1**		**Criterion 2a**		**Criterion 2b**		**Total**
Specialty care area	N	%	N	%	N	%	
Bone marrow transplant	77	54.6	32	22.7	32	22.7	141
Hematology/oncology	23	41.8	21	38.2	11	20.0	55
Total	100	51.0	53	27.0	43	21.9	196

NOTE. See Horan et al[4] for criteria.
BSI, bloodstream infection; *LCBI*, laboratory-confirmed BSI.

Table 15. Distribution of specific sites of urinary catheter-associated UTI by location, 2006 through 2007

Type of location	**ASB**		**SUTI**		**Total**
Critical care units	N	%	N	%	N
Burn	51	23.5	166	76.5	217
Coronary	311	48.9	325	51.1	636
Medical	544	38.3	875	61.7	1419
Medical/surgical, major teaching	334	34.0	647	66.0	981
Medical/surgical, all others	759	47.3	844	52.7	1603
Neurosurgical	147	30.3	338	69.7	485
Pediatric medical/surgical	51	23.0	171	77.0	222
Surgical cardiothoracic	218	43.1	288	56.9	506
Surgical	497	43.4	648	56.6	1145
Trauma	145	23.2	479	76.8	624
Inpatient wards					
Adult step down unit (postcritical care)	46	42.2	63	57.8	109
Medical	122	55.5	98	44.5	220
Medical/surgical	189	55.4	152	44.6	341
Rehabilitation	53	54.1	45	45.9	98
Surgical	55	56.7	42	43.3	97
Total	3522	40.5	5181	59.5	8703

NOTE. See Horan et al[4] for criteria.

Table 16. Distribution of specific sites of ventilator-associated pneumonia by location, 2006 through 2007

Type of location	PNU1		PNU2		PNU3		Total
Critical care units	N	%	N	%	N	%	N
Burn	171	70.4	71	29.2	1	0.4	243
Coronary	126	59.7	83	39.3	2	0.9	211
Medical	497	75.8	154	23.5	5	0.8	656
Medical/surgical, major teaching	443	64.0	248	35.8	1	0.1	692
Medical/surgical, all others	420	52.0	383	47.4	5	0.6	808
Neurologic	77	76.2	24	23.8	0	0.0	101
Neurosurgical	158	60.1	105	39.9	0	0.0	263
Pediatric medical/surgical	135	76.7	39	22.2	2	1.1	176
Surgical cardiothoracic	293	56.0	228	43.6	2	0.4	523
Surgical	626	65.6	293	30.7	35	3.7	954
Trauma	323	44.9	394	54.8	2	0.3	719
Inpatient wards							
Adult step down unit (postcritical care)	19	82.6%	4	17.4%	0	0.0%	23
Total	3288	61.2%	2026	37.7%	55	1.0%	5369

NOTE. See Horan et al[4] for criteria.

Table 17. Distribution of specific sites and criteria for device-associated BSI among level III NICUs by birth weight, 2006 through 2007

	LCBI						CSEP		Total
	Criterion 1		Criterion 2a/3a		Criterion 2b/3b				
Birth-weight category	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**
Central line-associated BSI									
≤750 g	152	44.8	45	13.3	117	34.5	25	7.4	339
750-1000 g	133	48.7	37	13.6	88	32.2	15	5.5	273
1001-1500 g	100	45.7	32	14.6	75	34.2	12	5.5	219
1501-2500 g	69	46.9	28	19.0	42	28.6	8	5.4	147
>2500 g	50	40.7	20	16.3	37	30.1	16	13.0	123
Total	504	45.8	162	14.7	359	32.6	76	6.9	1101
Umbilical catheter-associated BSI									
≤750 g	52	44.1	13	11.0	40	33.9	13	11.0	118
750-1000 g	24	35.8	10	14.9	28	41.8	5	7.5	67
1001-1500 g	21	45.7	6	13.0	14	30.4	5	10.9	46
1501-2500 g	10	45.5	2	9.1	7	31.8	3	13.6	22
>2500 g	12	41.4	5	17.2	7	24.1	5	17.2	29
Total	119	42.2	36	12.8	96	34.0	31	11.0	282

NOTE. See Horan et al[4] for criteria.

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 birth weight, 2006 through 2007

	LCBI						CSEP		Total
	Criterion 1		Criterion 2a/3a		Criterion 2b/3b				
Birth-weight category	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**
Central line-associated BSI									
≤750 g	77	44.5	28	16.2	61	35.3	7	4.0	173
750-1000 g	57	47.1	25	20.7	38	31.4	1	0.8	121
1001-1500 g	44	47.3	14	15.1	31	33.3	4	4.3	93
1501-2500 g	17	36.2	9	19.1	21	44.7	0	0.0	47
>2500 g	12	20.7	7	12.1	37	63.8	2	3.4	58
Total	207	42.1	83	16.9	188	38.2	14	2.8	492
Umbilical catheter-associated BSI									
≤750 g	35	53.0	18	27.3	10	15.2	3	4.5	66
750-1000 g	15	38.5	2	5.1	22	56.4	0	0.0	39
1001-1500 g	10	37.0	2	7.4	15	55.6	0	0.0	27
1501-2500 g	5	50.0	1	10.0	4	40.0	0	0.0	10
>2500 g	4	20.0	4	20.0	11	55.0	1	5.0	20
Total	69	42.6	27	16.7	62	38.3	4	2.5	162

NOTE. See Horan et al[4] for criteria.
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 2007

	PNU1		PNU2		PNU3		Total
Birth-weight category	**N**	**%**	**N**	**%**	**N**	**%**	**N**
≤750 g	121	84.0	23	16.0	0	0.0	144
750-1000 g	52	72.2	20	27.8	0	0.0	72
1001-1500 g	26	81.3	6	18.8	0	0.0	32
1501-2500 g	12	70.6	4	23.5	1	5.9	17
>2500 g	14	82.4	3	17.6	0	0.0	17
Total	225	79.8	56	19.9	1	0.4	282

NOTE. See Horan et al[4] for criteria.

Table 20. Distribution of specific sites of ventilator-associated pneumonia among level II/III NICUs by birth weight, 2006 through 2007

	PNU1		PNU2		PNU3		Total
Birth-weight category	**N**	**%**	**N**	**%**	**N**	**%**	**N**
≤750 g	44	65.7	21	31.3	2	3.0	67
750-1000 g	39	83.0	7	14.9	1	2.1	47
1001-1500 g	7	63.6	4	36.4	0	0.0	11
1501-2500 g	5	83.3	1	16.7	0	0.0	6
>2500 g	5	71.4	2	28.6	0	0.0	7
Total	100	72.5	35	25.4	3	2.2	138

NOTE. See Horan et al[4] for criteria.

Table 21. Pooled means and key percentiles of the distribution of postprocedure pneumonia rates,* PA module, 2006 through 2007

PPP rate-inpatient procedures						Percentile				
Procedure code	Operative procedure description	No. of hospitals	No. of PPP	No. of procedures	Pooled mean	10%	25%	50% (median)	75%	90%
AAA	Abdominal aortic aneurysm repair	13	4	302	1.32					
CARD	Cardiac surgery	21	29	2797	1.04	0.00	0.00	0.40	1.98	3.42
CBGB	Coronary bypass w/chest and donor incisions	35	117	12,683	0.92	0.00	0.00	0.21	1.25	2.64
CBGC	Coronary bypass graft with chest incision	29	5	535	0.93					
COLO	Colon surgery	25	28	4635	0.60	0.00	0.00	0.00	0.74	1.10
CSEC	Cesarean section	15	2	4490	0.04					
FUSN	Spinal fusion	17	7	4871	0.14					
FX	Open reduction of fracture	11	4	2256	0.18					
HPRO	Hip prosthesis	33	14	7760	0.18	0.00	0.00	0.00	0.00	0.47
HYST	Abdominal hysterectomy	20	1	4794	0.02	0.00	0.00	0.00	0.00	0.00
KPRO	Knee prosthesis	34	7	12,758	0.05	0.00	0.00	0.00	0.00	0.00
LAM	Laminectomy	11	1	4614	0.02					
PVBY	Peripheral vascular bypass surgery	10	2	841	0.24					
VHYS	Vaginal hysterectomy	24	0	2048	0.00					

*Per 100 operations.
PPP, postprocedure pneumonia.

Table 22. SSI rates* by operative procedure and risk index category, PA module, 2006 through 2007

SSI rate-inpatient procedures						
Procedure code	Operative procedure description	Duration cut point (min)	Risk index category	No. of procedures	No. of SSI	Pooled mean
AAA	Abdominal aortic aneurysm repair	225	0,1	881	16	1.82
AAA	Abdominal aortic aneurysm repair	225	2,3	288	15	5.21
APPY	Appendix surgery	81	0,1	2691	40	1.49
APPY	Appendix surgery	81	2,3	372	13	3.49
AVSD	Arteriovenostomy for renal dialysis	111	0,1,2,3	606	6	0.99
BILI	Bile duct, liver or pancreatic surgery	330	0,1	422	37	8.77
BILI	Bile duct, liver or pancreatic surgery	330	2,3	202	33	16.34
BRST	Breast surgery	202	0	997	8	0.80
BRST	Breast surgery	202	1	914	25	2.74
CARD	Cardiac surgery	300	0,1	10,382	121	1.17
CARD	Cardiac surgery	300	2,3	3396	58	1.71
CBGB	Coronary bypass w/chest and donor incision	300	0	1003	3	0.30
CBGB	Coronary bypass w/chest and donor incision	300	1	47,296	1399	2.96
CBGB	Coronary bypass w/chest and donor incision	300	2,3	15,706	767	4.88
CBGC	Coronary bypass graft with chest incision	285	0,1	3495	57	1.63
CBGC	Coronary bypass graft with chest incision	285	2,3	1147	33	2.88
CEA	Carotid endarterectomy	133	0,1,2,3	2615	11	0.42
CHOL	Gallbladder surgery	121	0,1,2,3	3337	23	0.69
COLO	Colon surgery	188	0	9539	399	4.18
COLO	Colon surgery	188	1	16,537	1004	6.07
COLO	Colon surgery	188	2	7270	582	8.01
COLO	Colon surgery	188	3	810	88	10.86
CRAN	Craniotomy	219	0,1	4596	99	2.15
CRAN	Craniotomy	219	2,3	1048	49	4.68
CSEC	Cesarean section	57	0	12,351	185	1.50
CSEC	Cesarean section	57	1,2,3	5951	157	2.64
FUSN	Spinal fusion	240	0	11,780	85	0.72
FUSN	Spinal fusion	240	1	9559	186	1.95
FUSN	Spinal fusion	240	2,3	2543	105	4.13
FX	Open reduction of fracture	137	0	2143	23	1.07

Continued

Table 22. Continued

SSI rate-inpatient procedures						
Procedure code	**Operative procedure description**	**Duration cut point (min)**	**Risk index category**	**No. of procedures**	**No. of SSI**	**Pooled mean**
FX	Open reduction of fracture	137	1	3376	57	1.69
FX	Open reduction of fracture	137	2,3	714	19	2.66
GAST	Gastric surgery	168	0,1	3807	70	1.84
GAST	Gastric surgery	168	2,3	1090	53	4.86
HER	Herniorrhaphy	133	0	1182	12	1.02
HER	Herniorrhaphy	133	1	1499	37	2.47
HER	Herniorrhaphy	133	2,3	596	26	4.36
HPRO	Hip prosthesis	123	0	17,521	131	0.75
HPRO	Hip prosthesis	123	1	22,681	380	1.68
HPRO	Hip prosthesis	123	2,3	5492	163	2.97
HYST	Abdominal hysterectomy	138	0	13,529	152	1.12
HYST	Abdominal hysterectomy	138	1	6422	155	2.41
HYST	Abdominal hysterectomy	138	2,3	1419	62	4.37
KPRO	Knee prosthesis	122	0	29,264	198	0.68
KPRO	Knee prosthesis	122	1	31,979	359	1.12
KPRO	Knee prosthesis	122	2,3	7955	145	1.82
LAM	Laminectomy	167	0	13,144	96	0.73
LAM	Laminectomy	167	1	9549	106	1.11
LAM	Laminectomy	167	2,3	2545	62	2.44
PACE	Pacemaker surgery	65	0,1,2,3	1812	4	0.22
PVBY	Peripheral vascular bypass surgery	228	0	300	6	2.00
PVBY	Peripheral vascular bypass surgery	228	1,2,3	3376	226	6.69
REC	Rectal surgery	253	0,1,2	736	21	2.85
RFUSN	Refusion of spine	312	0,1	500	13	2.60
RFUSN	Refusion of spine	312	2,3	81	8	9.88
SB	Small bowel surgery	206	0	535	14	2.62
SB	Small bowel surgery	206	1,2,3	2265	143	6.31
VHYS	Vaginal hysterectomy	132	0	5893	45	0.76
VHYS	Vaginal hysterectomy	132	1,2,3	2941	37	1.26
VSHN	Ventricular shunt	80	0	572	16	2.80
VSHN	Ventricular shunt	80	1,2,3	2791	144	5.16
XLAP	Exploratory abdominal surgery	210	0,1,2,3	3011	59	1.96

SSI rate-outpatient procedures						
Procedure code	**Operative procedure description**	**Duration cut point (min)**	**Risk index category**	**No. of procedures**	**No. of SSI**	**Pooled mean**
HER	Herniorrhaphy	63	0	1768	7	0.40
HER	Herniorrhaphy	63	1	1092	12	1.10
HER	Herniorrhaphy	63	2,3	207	7	3.38
LAM	Laminectomy	90	0,1,2,3	302	4	1.32

SSI, surgical site infection.
*Per 100 operations.

with the methods described for NHSN.[3,5,8] 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 device-associated 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. Hospitals should use these data to guide local prevention strategies and other quality improvement efforts aimed at reducing the occurrence of infections as much as possible.

Table 23. Percentiles of the distribution of SSI rates,* PA module, 2006 through 2007

SSI percentiles-inpatient procedures					Percentile				
Procedure code	Operative procedure description	Risk index category	No. of hospitals	Pooled mean	10%	25%	50% (median)	75%	90%
CARD	Cardiac surgery	0,1	64	1.17	0.00	0.00	0.66	1.58	2.91
CARD	Cardiac surgery	2,3	46	1.71	0.00	0.00	1.10	2.79	3.65
CBGB	Coronary bypass w/chest and donor incision	1	160	2.96	0.00	1.18	2.48	4.09	5.34
CBGB	Coronary bypass w/chest and donor incision	2,3	134	4.88	0.00	2.00	3.80	6.52	10.08
CBGC	Coronary bypass graft with chest incision	0,1	55	1.63	0.00	0.00	0.00	3.30	5.08
CEA	Carotid endarterectomy	0,1,2,3	21	0.42	0.00	0.00	0.00	0.94	1.48
COLO	Colon surgery	0	121	4.18	0.00	0.95	3.70	6.02	9.44
COLO	Colon surgery	1	184	6.07	0.00	2.22	4.76	8.33	12.50
COLO	Colon surgery	2	123	8.01	0.00	2.11	6.06	9.56	15.83
CRAN	Craniotomy	0,1	27	2.15	0.00	0.00	1.61	2.10	4.27
CSEC	Cesarean section	0	32	1.50	0.00	0.29	1.33	3.05	3.44
CSEC	Cesarean section	1,2,3	33	2.64	0.00	0.19	1.99	4.00	8.41
FUSN	Spinal fusion	0	59	0.72	0.00	0.00	0.37	0.99	1.78
FUSN	Spinal fusion	1	59	1.95	0.00	0.71	1.54	2.70	3.81
FUSN	Spinal fusion	2,3	38	4.13	0.00	1.94	4.00	5.52	9.21
FX	Open reduction of fracture	1	23	1.69	0.00	0.69	1.52	2.43	4.08
GAST	Gastric surgery	0,1	23	1.84	0.00	0.70	1.48	2.90	3.80
HPRO	Hip prosthesis	0	110	0.75	0.00	0.00	0.28	1.04	2.04
HPRO	Hip prosthesis	1	127	1.68	0.00	0.00	1.35	2.13	3.01
HPRO	Hip prosthesis	2,3	69	2.97	0.00	0.00	2.21	4.00	6.89
HYST	Abdominal hysterectomy	0	84	1.12	0.00	0.00	0.70	1.95	2.67
HYST	Abdominal hysterectomy	1	67	2.41	0.00	0.00	1.88	3.60	7.78
HYST	Abdominal hysterectomy	2,3	24	4.37	0.00	0.00	3.13	5.66	8.63
KPRO	Knee prosthesis	0	126	0.68	0.00	0.00	0.32	0.90	1.46
KPRO	Knee prosthesis	1	138	1.12	0.00	0.00	0.77	1.49	2.63
KPRO	Knee prosthesis	2,3	89	1.82	0.00	0.00	1.63	2.81	5.00
LAM	Laminectomy	0	50	0.73	0.00	0.00	0.56	1.44	2.36
LAM	Laminectomy	1	51	1.11	0.00	0.00	0.98	1.99	2.41
LAM	Laminectomy	2,3	34	2.44	0.00	0.00	1.67	3.18	4.17
PVBY	Peripheral vascular bypass surgery	1,2,3	36	6.69	0.00	2.87	4.69	7.69	12.05
VHYS	Vaginal hysterectomy	0	54	0.76	0.00	0.00	0.00	1.74	2.13
VHYS	Vaginal hysterectomy	1,2,3	40	1.26	0.00	0.00	0.00	1.15	3.61

SSI, surgical site infection.
*Per 100 operations.

Table 24. SSI rates* following inpatient coronary artery bypass graft procedure, by risk index category and specific site, PA module, 2006 through 2007

Risk index category	0		1		2,3	
Infection site	No. SSI	Rate	No. SSI	Rate	No. SSI	Rate
Secondary (donor site)	**1**	**0.10**	**362**	**0.77**	**266**	**1.69**
Superficial incisional	1	0.10	288	0.61	211	1.34
Deep incisional	0	0.00	74	0.16	55	0.35
Primary (chest site)	**2**	**0.20**	**1037**	**2.19**	**501**	**3.19**
Superficial incisional	1	0.10	451	0.95	197	1.26
Deep incisional	1	0.10	315	0.67	162	1.03
Organ/space	0	0.00	271	0.57	142	0.90
Total	**3**	**0.30**	**1399**	**2.96**	**767**	**4.88**

NOTE. Denominators for the risk categories are as follows: category 0 = 1003; category 1 = 47,296; category 2,3 = 15,706.
CBGB, coronary artery bypass graft with primary (chest) and secondary (donor) incisions.
*Per 100 operations.

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References

1. 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.
2. CDC NNIS System. National Nosocomial Infections Surveillance (NNIS) system report, data summary from January 1992 to June 2004, issued October 2004. Am J Infect Control 2004;32:440–85.
3. Centers for Disease Control and Prevention. Outline for healthcare-associated infection surveillance. Available at: http://www.cdc.gov/ncidod/dhqp/nhsn_documents.html (http://www.cdc.gov/ncidod/dhqp/pdf/nhsn/OutlineForHAISurveillance.pdf). Accessed July 22, 2008.
4. Horan TC, Gaynes RP. Surveillance of nosocomial infections. In: Mayhall CG, editor. Hospital epidemiology and infection control. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2004. p. 1659–702.
5. Centers for Disease Control and Prevention. NHSN manual: patient safety component protocols. Available at: http://www.cdc.gov/ncidod/dhqp/nhsn_documents.html (http://www.cdc.gov/ncidod/dhqp/pdf/nhsn/NHSN_Manual_PatientSafetyProtocol_CURRENT.pdf). Accessed July 22, 2008.
6. Klevens RM, Edwards JR, Andrus ML, Peterson KD, Dudeck MA, Horan TC, the NHSN participants in outpatient dialysis surveillance. Semin Dial 2008;21:24-8.
7. 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): S185-S191.
8. 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.
9. Centers for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter-related infections. MMWR 2002; 51(RR-10):1-29.
10. Centers for Disease Control and Prevention. Guidelines for preventing health-care-associated pneumonia, 2003: recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee. MMWR 2004;53(RR-3):1-23.

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 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 used 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; 5 on day 2; 2 on day 3; 5 on day 4; 3 on day 5; 4 on day 6; and 4 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: >

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

Example:

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

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:

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

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

Step 6 Examine the size of the denominator for your hospital's rate or ratio. Rates or ratios may not be good estimates of the "true" rate or ratio for your hospital if the denominator is small, 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 2 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 whether 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 your hospital's rate or ratio 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 your hospital's rate or ratio 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 percentile. Since the ventilator is a significant risk factor for pneumonia, you may want to target your efforts on reducing the use of ventilators or limiting the duration with which they are used on patients to lower the ventilator-associated pneumonia rate in the unit.