



DELAWARE HEALTH AND SOCIAL SERVICES

Division of Public Health

Office of Infectious Disease Epidemiology

Delaware Healthcare-Associated Infections Annual Report 2014



Delaware Health and Social Services
Division of Public Health
Infectious Disease Prevention and Control

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Acronyms

CAUTI	Catheter Associated Urinary Tract Infection
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval (LCL=Lower Confidence Limit, UCL=Upper Confidence Limit)
CLABSI	Central Line Associated Bloodstream Infection
CMS	Centers for Medicare and Medicaid Services
CDI	<i>Clostridium difficile</i> (<i>C. Diff</i>) infection
DHSS	Delaware Department of Health and Social Services
HAI	Healthcare-Associated Infection
HAIAC	Healthcare-Associated Infections Advisory Committee
ICU	Intensive Care Unit
IP	Infection Preventionist
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
MRSA-CA	Community-acquired MRSA infection
MRSA-HA	Healthcare-associated MRSA infection
NHSN	National Healthcare Safety Network
SIR	Standardized Infection Ratio
SSI	Surgical Site Infection
UTI	Urinary Tract Infection

Executive Summary

Title 16 Chapter 10a of the Delaware Code established the “Healthcare Associated Infections Disclosure Act” in 2007.¹ The law requires hospitals to report healthcare-associated infections (HAIs) to the Department of Health and Social Services (DHSS) by using the Centers for Disease Control and Prevention’s (CDC) National Healthcare Safety Network (NHSN).² The law’s purpose is to make information available to the public about the occurrence of healthcare-associated infections in Delaware healthcare facilities. The Healthcare-Associated Infections Advisory Committee (HAIAC) was created to oversee implementation of the Healthcare Associated Disclosure Act. The Advisory Committee determined that Delaware would follow the healthcare facility reporting requirements of the Centers for Medicare and Medicaid Services (CMS).³

In 2013, acute care hospitals were required to report data for catheter-associated urinary tract infections (CAUTIs) and central line-associated bloodstream infections (CLABSIs) from intensive care units (ICUs) only; surgical site infections (SSIs) for inpatient colon surgeries and abdominal hysterectomies; and facility-wide methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia (bloodstream infections) and *Clostridium difficile* (*C. Diff*) infections. These infections are a threat to patient safety and are a significant cause of illness and death. Development and implementation of strategies to reduce and prevent HAIs are a priority for the HAIAC.

All hospitals in Delaware report HAI data through NHSN, which is an internet-based national surveillance system that collects data from healthcare facilities. It provides facilities with risk-adjusted data that can be used for within facility comparisons and to inform local quality improvement activities. HAI rates are reported using the standardized infection ratio (SIR) which is a summary measure for comparing the number of infections observed at each hospital to an “expected” number of infections. The expected number of infections is standardized using the historical rate of infections in similar US hospitals. In addition to computing SIR estimates, 95% confidence intervals (CIs) are used to indicate the level of statistical reliability of the SIR estimate. Small numbers of devices and procedures at facilities in Delaware may result in SIRs that are statistically uninterpretable.

In 2014, the SIR for CLABSIs in all acute care hospitals (ICUs) combined in Delaware was significantly lower than expected based on similar hospitals in the U.S. (SIR= 0.39, 95% CI=0.27, 0.54). The SIR for CAUTIs in acute care hospitals (ICUs) in Delaware was higher than the rate of CAUTIs in similar hospitals in the U.S. (SIR=1.21, 95% CI=0.95, 1.53). The SIR for colon surgery SSIs was significantly higher than the rate of SSIs in similar hospitals in the U.S. (SIR=1.41, 95% CI=1.06, 1.84). The SIR for SSIs following hysterectomy in Delaware did not differ statistically from the rate of SSIs in similar hospitals in the U.S. (SIR=0.95, 95% CI=0.49, 1.70). For *C. Diff* infections, the SIR did not differ statistically from 1.0 (SIR=1.06, 95% CI=0.96, 1.16) and for MRSA the number of observed infections in Delaware during 2014 also did not differ statistically from the number expected (SIR=1.01, 95% CI=0.72, 1.38).

It is important to note that healthcare facilities in Delaware actively implement prevention initiatives to reduce the overall observed number of HAIs in their facilities.

¹ Title 16 Chapter 10A of the Delaware Code <http://delcode.delaware.gov/title16/c010a/index.shtml>

² <http://www.cdc.gov/nhsn/>

³ <http://www.cdc.gov/nhsn/PDFs/CMS/CMS-Reporting-Requirements.pdf>

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Background

Healthcare-associated infections (HAIs) are infections that patients develop during the course of receiving treatment for other conditions within a healthcare setting. These HAIs can worsen existing illnesses or prolong hospital stays. The most recent CDC survey that sampled a large number of U.S. acute care hospitals found that on any given day, about **1 in 25** hospitalized patients has at least one HAI. There were an estimated **722,000** HAIs in U.S acute care hospitals in 2011 and about **75,000** hospitalized patients with HAIs died during their hospital stay. More than half of all HAIs occurred outside of the intensive care unit.⁴

The Delaware General Assembly passed House Bill 47 in 2007, establishing the “Healthcare Associated Infections Disclosure Act” (Title 16 Chapter 10A of the *Delaware Code*).⁵ The law requires hospitals to report HAIs to the Department of Health and Social Services (DHSS) by using the Centers for Disease Control and Prevention’s (CDC) National Healthcare Safety Network (NHSN).⁶ CDC’s NHSN is the nation’s most widely used tracking system for healthcare-associated infections. NHSN provides healthcare facilities and states with data collection and reporting capabilities using standardized definitions, allowing them to identify infection prevention problem areas, benchmark progress and comply with public reporting mandates in order to drive progress towards elimination of HAIs.

The law requires DHSS to submit an annual report to the legislature. This report serves that purpose for HAIs that were reported to occur in Delaware from January 1, 2014, through December 31, 2014. As required by law, this annual report is published alongside quarterly reports on the Division of Public Health HAI website and will be made available to anyone upon request.

The Healthcare-Associated Infections Advisory Committee (HAIAC) was appointed by the Secretary of DHSS in 2007 (Appendix A). The Advisory Committee assisted DHSS in the development of regulations, reviewed the NHSN requirements and selected reporting requirements for Delaware.⁷

Appendix B is reserved for “Hospital Comments” on performance improvement and changes in patient population and risk factors. By law, these comments are reviewed by DHSS but are “considered proprietary information and shall not be made available in the Public Report and shall not be subject to disclosure under the State’s Freedom of Information Act.”⁸

⁴ Magill SS, Edwards JR, Beldavs ZG, et al. Prevalence of Antimicrobial Use in US Acute Care Hospitals, May-September 2011. *JAMA*. 2014;312(14):1438-1446. <http://jama.jamanetwork.com/article.aspx?articleid=1911328>

⁵ <http://delcode.delaware.gov/title16/c010a/index.shtml>

⁶ <http://www.cdc.gov/nhsn/about.html>

⁷ <http://regulations.delaware.gov/documents/May2009c.pdf>

⁸ Title 16 Chapter 10A of the Delaware Code <http://delcode.delaware.gov/title16/c010a/index.shtml>

Reporting HAIs in Delaware

There are eight acute care hospitals in Delaware and all report HAIs through the National Healthcare Safety Network (NHSN). Beginning in mid-2012, the HAIAC determined that Delaware would follow the reporting requirements of the Centers for Medicare and Medicaid Services (CMS) effective as of September 1, 2013.⁹

Data on three types of infections are included in this report. First, CMS's requirements in 2012 meant that acute care hospitals report **Device-Associated Infections**: (1) catheter-associated urinary tract infections (CAUTIs) and (2) central line-associated bloodstream infections (CLABSIs) that occur in adult, pediatric and neonatal intensive care units (ICUs) at acute care hospitals in Delaware. Secondly, **Surgical Site Infections** (SSIs), specifically infections occurring after colon surgery and abdominal hysterectomy, are reported among adults in acute care hospitals. And third, as of January 2013, **MRSA Bacteremia and C. difficile** were added for facility-wide reporting.

Methods

All healthcare facilities are required to report data on infections to NHSN using standardized definitions and each facility has Infection Preventionists (IPs) who conduct this surveillance. For each type of infection, the IPs report the number of patients with infections (numerator) and the denominator, which can be the number of patients with a given device (device days) or total number of patients at risk (patient days).

The **standardized infection ratio (SIR)** is a summary measure used to track HAI prevention progress over time and can be calculated on a variety of levels, including unit, facility, state and nation. The SIR compares the number of infections reported in a given time period to the number of infections that would be predicted, using data from a historical baseline period. These baseline data are used to calculate the number of infections expected to occur in a healthcare facility or state. In this report, the national experience, or national baseline, is aggregated data reported to NHSN by all facilities during a baseline time period, according to type of infection.¹⁰

The SIR is calculated as the total number of observed infections divided by the total number of expected infections. Lower SIRs indicate better performance.

$$\text{SIR} = \frac{\text{Number of observed infections}}{\text{Number of predicted infections}}$$

⁹ <http://www.cdc.gov/nhsn/PDFs/CMS/CMS-Reporting-Requirements.pdf>

¹⁰ The number of predicted infections is an estimate based on infections reported to NHSN during the following time periods: 2006 to 2008: CLABSI and SSI; 2009: CAUTI; and 2010 to 2011: MRSA and *C. difficile*. Moving forward, HAI prevention progress for 2016 and subsequent years will be measured in comparison to infection data from 2015.

The SIRs are adjusted for risk factors that may impact the number of infections reported by a hospital, such as type of patient location, bed size of the hospital, patient age and other factors. The expected number of infections is adjusted differently depending on the type of infection measured as shown below.¹¹

SIRs for CLABSIs and CAUTIs are adjusted for:

- Type of patient care location
- Hospital affiliation with a medical school
- Bed size of the patient care location

SIRs for SSIs are presented using CDC's Complex Admission / Readmission (A/R) model, which takes into account patient differences and procedure-related risk factors within each type of surgery. These risk factors include:

- Duration of surgery
- Surgical wound class
- Use of endoscopes
- Re-operation status
- Patient age
- Patient assessment at time of anesthesiology

SIRs for hospital-onset *C. difficile* and MRSA bloodstream infections are adjusted using slightly different risk factors:

- Facility bed size
- Hospital affiliation with a medical school
- The number of patients admitted to the hospital who already have *C. difficile* or an MRSA bloodstream infection (community-acquired cases)
- For hospital-onset *C. difficile*, the SIR also adjusts for the type of test the hospital laboratory uses to identify *C. difficile* from patient specimens.

Interpretation of the Standardized Infection Ratio (SIR)

When the SIR is calculated, there are three possible results:

- ✘ The SIR is less than 1.0 – this indicates that there were fewer infections reported during the surveillance period than would have been predicted given the baseline data.
- ✘ The SIR is equal to 1.0 – as in any ratio, the value of 1 indicates that the numerator and denominator are equal. In this case, the number of infections reported during the surveillance period is the same as the number of infections predicted given the baseline data.
- ✘ The SIR is greater than 1.0 – this indicates that there were more infections reported during the surveillance period than would have been predicted given the baseline data.

The SIR is not calculated when the "expected" number of infections is less than 1, which is due to small numbers of devices or procedures.

¹¹ http://www.cdc.gov/HAI/surveillance/QA_stateSummary.html#b7

Confidence Interval

Because the SIR is an estimate of the “true” value, confidence intervals (CI) are also provided, which indicate the range of values in which the true SIR is thought to lie. The upper and lower limits are used to determine the statistical significance and precision of the SIR. We have a high degree of confidence that the true SIR lies within this range. If the confidence interval includes the value of 1.0, then the SIR is *not statistically significant* (i.e., the number of observed events is not significantly different than the number predicted). If the confidence interval does not include the value of 1.0, then the SIR is *statistically significant* (i.e. the number of observed events is significantly different than the number predicted). The confidence intervals are generally calculated at 95 percent (95% CI), which is an arbitrary and conveniently used level indicating that we are 95 percent confident that the true SIR falls between the upper and lower limits of the CI.¹²

Results

(1) Device-Related HAIs

Central Line-Associated Bloodstream Infection (CLABSI)

A “central line” is a tube that is placed into a patient’s large vein or artery, usually in the neck, chest, arm, or groin. The catheter is often used as a device to draw blood, to give fluids, or to administer medications and may not be removed for several weeks. A bloodstream infection can occur when bacteria or other germs travel down a “central line” and enter the blood.

An estimated 30,100 central line-associated bloodstream infections (CLABSIs) occur in intensive care units and wards of U.S. acute care facilities each year.¹³ These infections are usually serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality. CLABSIs can be prevented through proper insertion and management of the central line. In Table 1 are numbers of device days by hospital for CAUTIs and CLABSIs. A ‘device day’ is a count of patients with a specific device in the patient care location during a time period. This count is determined electronically or manually by daily or weekly sampling.

The standardized infection ratio for CLABSIs in Delaware ICUs was lower than the standard population, as indicated by the SIR of 0.39 (Table 1a). The 95% CI for this estimate was 0.27 to 0.54, which indicates that the result is statistically significant because it excludes 1.0. Estimated SIRs for Christiana and Al duPont were lower than expected and were based on relatively large numbers of device days. SIRs for five other hospitals (Beebe, Milford, Nanticoke, St. Francis and Wilmington) were lower than expected but these SIR estimates were too imprecise to interpret accurately. The SIR for Kent General was higher than expected but again this estimate was too imprecise to interpret with a high level of confidence.

¹² Rothman KJ, Greenland S, Lash TL. Study Design and Conduct. Modern Epidemiology. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008.

¹³ http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf

Catheter-Associated Urinary Tract Infection (CAUTI)

Urinary catheters are tubes inserted into the bladder through the urethra to drain urine. Twelve to 16 percent of adult hospitalized patients will have a urinary catheter during their hospital stay.¹⁴ A urinary tract infection (UTI) involves any part of the urinary system including the urethra, bladder, ureters and kidney.

UTIs account for more than 15 percent of infections reported by acute care hospitals and are tied with pneumonia as the second most common type of healthcare-associated infection, second only to SSIs.¹⁵ Approximately 80 percent of healthcare-associated UTIs are caused by instrumentation of the urinary tract. CAUTIs may cause discomfort to the patient, prolonged hospital stay and increased cost and mortality.¹⁶ It has been estimated that annually, more than 13,000 deaths are associated with CAUTIs.¹⁷

The standardized infection ratio of CAUTIs for Delaware was higher than predicted, as indicated by the SIR of 1.21 (Table 1b), which is interpreted as 21 percent more infections than predicted. The SIR for Kent General was higher than expected and was statistically significant based on the confidence limits of 1.65 to 3.83. The SIR for Christiana Hospital was modestly higher than expected. For the remaining five hospitals, small numbers of device days contributed to imprecise SIR estimates, making results difficult to interpret.

Table 1. Device-Related HAIs (CLABSIs and CAUTIs) Standardized Infection Ratio (SIR) Report by Facility, Delaware Acute Care Hospitals, January 1 – December 31, 2014

Device-Related HAIs							
1a. Central Line-Associated Bloodstream Infections (CLABSIs)							
Hospital	Central Line Device Days ^a	Number of Infections		SIR ^b	95% CI ^c		Interpretation of SIR [*]
		Observed	Expected		Lower ^d	Upper	
ALL ^f	34,527	31	80.02	0.39	0.27	0.54	★ Better
Al duPont	9,295	12	26.96	0.45	0.24	0.76	★ Better
Beebe	3,840	5	5.76	0.87	0.32	1.92	= Same
Christiana	13,653	10	34.21	0.29	0.15	0.52	★ Better
Kent General	3,500	3	5.76	0.52	0.13	1.42	= Same
Milford	1,072	0	1.61	0.00	---	1.86	= Same
Nanticoke	1,170	1	1.76	0.57	0.03	2.81	= Same
St. Francis	1,148	0	2.18	0.00	---	1.37	= Same
Wilmington	849	0	1.78	0.00	---	1.68	= Same

¹⁴ http://www.cdc.gov/HAI/ca_uti/uti.html

¹⁵ Magill, SS., Hellinger, W., et al. "Prevalence of Healthcare-associated Infections in Acute Care Facilities". *Infection Control Hospital Epidemiology*. 33: (2012):283-291.

¹⁶ Scott Rd. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention, 2009. Division of Healthcare Quality Promotion, National Center for Preparedness, Detection, and Control of Infectious Diseases, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, February 2009.

¹⁷ Klevens, RM., Edward, JR., et al. "Estimating Healthcare-associated Infections and Deaths in U.S. Hospitals." *Public Health Reports* 122: (2007):160-166.

1b. Catheter-Associated Urinary Tract Infections (CAUTIs)							
Hospital	Urinary Catheter Device Days ^a	Number of Infections		SIR ^b	95% CI ^c		Interpretation of SIR [*]
		Observed	Expected		Lower ^d	Upper	
ALL ^f	25,149	68	56.20	1.21	0.95	1.53	= Same
Al duPont	2,514	5	6.94	0.72	0.26	1.60	= Same
Beebe	3,835	5	4.60	1.09	0.40	2.41	= Same
Christiana	10,108	34	28.46	1.19	0.84	1.65	= Same
Kent General	4,089	22	8.55	2.57	1.65	3.83	X Worse
Milford	1,243	0	1.62	0.00	---	1.85	= Same
Nanticoke	1,415	1	1.84	0.54	0.03	2.68	= Same
St. Francis	969	1	1.94	0.52	0.03	2.55	= Same
Wilmington	976	0	2.25	0.00	---	1.34	= Same
* – Legend							
★ Significantly fewer infections (better) observed than predicted, based on the national baseline.	=	No significant difference (same) between the number of observed and predicted infections, based on the national baseline.		X	Significantly more infections (worse) observed than predicted, based on the national baseline.		No Conclusion The SIR is not calculated when the number of predicted infections is less than 1.

- a. Device day is a count of patients with a specific device in the patient care location during a time period.
b. SIR is only calculated if the expected number is greater than or equal to 1.
c. Confidence Limits are the endpoints of the confidence interval, which is a range of values that accounts for random error in estimation of the SIR.
d. Lower bound of 95% confidence interval is only calculated if observed number is greater than 0.

(2) Surgical Site Infections

A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place. Surgical site infections can sometimes be superficial infections involving the skin only while others are more serious and can involve tissues under the skin, organs, or implanted material.

All inpatient surgical procedures performed, to which one or more of the listed ICD-9-CM codes may be assigned, must be monitored for SSI and included in submitted SSI data. The ICD-9-CM codes and corresponding sets of CPT codes that comprise the abdominal hysterectomy and colon surgery operative procedure categories are provided by CDC.¹⁸

Because superficial SSIs may never come to the attention of the hospital's IP, to avoid penalizing hospitals who simply have more complete reporting as opposed to truly higher infection rate, the SSIs reported to CMS will include only deep incisional primary and organ/space infections which are routinely detected during the operative hospitalization, or upon readmission to a hospital. Only SSIs with an onset 30 days or less following the operative procedure and SSIs identified in patients who were 18 years or older at the time of their surgery are included in the data CDC reports to CMS.

¹⁸ Operational Guidance for Reporting Surgical Site Infection (SSI) Data to CDC's NHSN for the Purpose of Fulfilling CMS's Hospital Inpatient Quality Reporting (IQR) Program Requirements http://www.cdc.gov/nhsn/PDFs/CMS/Final-ACH-SSI-Guidance_2015.pdf

Colon Surgery

In Delaware in 2014, there were 41 percent more SSIs related to colon surgery than predicted (SIR = 1.41, Table 2a) and the SIR estimate is statistically significant. The SIR of 2.63 for Kent General Hospital was significantly higher than expected with the confidence interval ranging from 1.50 to 4.31. The SIR for Christiana Hospital was 39 percent higher than the general population but the SIR did not differ statistically from 1.0. For the other seven Delaware hospitals, numbers of predicted infections were small and the SIR estimates did not differ from 1.0.

Abdominal Hysterectomy

There were five percent fewer SSIs for abdominal hysterectomies than expected (SIR = 0.95, Table 2b) but this estimate was not statistically significant as the 95% CI = (0.49, 1.70) includes 1.0. The SIRs for Christiana, Kent General and Wilmington Hospitals did not differ from 1.0. SIRs could not be calculated for Beebe, Milford, Nanticoke and St. Francis Hospitals.

Table 2. Surgical Site Infection (SSI) Standardized Infection Ratio (SIR) Report by Surgery Type, Delaware Acute Care Hospitals, January 1 – December 31, 2014

Surgical Site Infections (SSIs)							
2a. Colon Surgery							
Hospital	Inpatient Procedures ^a	Number of Infections		SIR ^b	95% CI ^c		Interpretation of SIR [*]
		Observed	Expected		Lower ^d	Upper	
ALL ^e	1,096	50	35.49	1.41	1.06	1.84	X Worse
Beebe	134	1	4.06	0.25	0.01	1.21	= Same
Christiana	597	27	18.45	1.39	0.93	1.99	= Same
Kent General	163	14	5.32	2.63	1.50	4.31	X Worse
Milford	68	3	2.21	1.36	0.35	3.69	= Same
Nanticoke	49	1	1.57	0.64	0.03	3.15	= Same
St. Francis	30	1	1.09	0.92	0.05	4.55	= Same
Wilmington	55	3	1.78	1.69	0.43	4.59	= Same
2b. Abdominal Hysterectomy							
Hospital	Inpatient Procedures ^a	Number of Infections		SIR ^b	95% CI ^c		Interpretation of SIR [*]
		Observed	Expected		Lower ^d	Upper	
ALL ^e	1,110	10	10.48	0.95	0.49	1.70	= Same
Beebe	37	1	0.32	---	---	---	No Conclusion
Christiana	682	3	6.41	0.47	0.12	1.27	= Same
Kent General	162	3	1.55	1.97	0.49	5.27	= Same
Milford	18	1	0.16	---	---	---	No Conclusion
Nanticoke	49	0	0.46	---	---	---	No Conclusion
St. Francis	32	0	0.33	---	---	---	No Conclusion
Wilmington	130	2	1.27	1.58	0.27	5.21	= Same

* – Legend			
★ Significantly fewer infections (better) observed than predicted, based on the national baseline.	= No significant difference (same) between the number of observed and predicted infections, based on the national baseline.	✗ Significantly more infections (worse) observed than predicted, based on the national baseline.	No Conclusion The SIR is not calculated when the number of predicted infections is less than 1.

- An inpatient procedure is a procedure performed on a patient whose date of admission to the facility and date of discharge are different calendar days and the procedure takes place during a surgical operation.
- SIR is only calculated if the expected number is greater than or equal to 1.
- Confidence Limits are the endpoints of the confidence interval, which is a range of values that accounts for random error in estimation of the SIR.
- Lower bound of 95% confidence interval is only calculated if observed number is greater than 0.
- Al duPont is not included in the statewide SIR estimate for SSIs because colon surgeries and abdominal hysterectomies are not routinely performed at this hospital (i.e. pediatric population).

(3) Hospital-Onset Laboratory-Identified Events

Laboratory-Identified (LabID) event reporting allows laboratory testing data to be used without clinical evaluation of the patient, allowing for a much less labor-intensive method to track MRSA and *C. difficile*. Of note, while all MRSA bacteremia can be considered true infections, a positive laboratory test for *C. difficile* may or may not indicate *C. difficile* disease rather than colonization. While providers should only test those patients in whom they suspect *C. difficile* disease, this test is probably over-utilized. Even those patients who the provider does not consider as having *C. difficile* disease are included in the NHSN LabID event reporting

***Clostridium difficile* Infection (C. Diff)**

Clostridium difficile, also known as *C. difficile*, *C. diff*, CDI (*Clostridium difficile* infection) or CDAD (*Clostridium difficile*-associated disease), is a bacterium that causes inflammation of the colon and antibiotic use is the most important risk factor, along with increasing age. *C. difficile* was estimated to cause almost half a million infections in the United States in 2011, and 29,000 died within 30 days of the initial diagnosis. CDC provides guidelines and tools to the healthcare community to help prevent *C. difficile* infections and also provides resources to help the public safeguard their own health.¹⁹

The number of *C. Diff* infections in Delaware was not statistically different from 1.0, with an SIR = 1.06 and 95% CI that ranged from 0.96 to 1.16 (Table 3a). The SIR for St. Francis Hospital was significantly lower than expected (SIR = 0.41, 95% CI = 0.17, 0.85). SIR estimates for Beebe (SIR = 1.72) and Nanticoke (SIR = 1.57) Hospitals were higher than expected and both these SIR estimates were significantly elevated. SIRs for *C. Diff* infections in the other five acute care hospitals did not differ from 1.0.

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of staph bacteria that is resistant to

¹⁹ http://www.cdc.gov/HAI/organisms/cdiff/Cdiff_infect.html

certain antibiotics called beta-lactams. These antibiotics include methicillin and other more common antibiotics such as oxacillin or nafcillin.

There are two types of MRSA strains: community-acquired (CA-MRSA) and healthcare-associated (HA-MRSA). In the community, MRSA infections usually manifest as skin infections, such as pimples and boils, and occur in otherwise healthy people. More severe or potentially life-threatening MRSA infections, such as bloodstream infections, pneumonia and surgical site infections, occur most frequently among patients in healthcare settings. MRSA infections included in this report are only those associated with healthcare settings.

The number of MRSA (HA-MRSA) infections in Delaware during 2014 did not differ from the number expected (SIR = 1.01). The SIRs for all hospitals, with the exception of St. Francis where the SIR could not be calculated, did not differ statistically from 1.0.

Table 3. *C. Diff* and MRSA Standardized Infection Ratio (SIR) Report, Hospital-Onset Laboratory-Identified Events, Delaware Acute Care Hospitals, January 1 – December 31, 2014

Hospital-Onset Laboratory-Identified Events							
3a. <i>Clostridium difficile</i> Infection (<i>C. Diff</i>)							
Hospital	Patient Days	Number of Infections		SIR ^b	95% CI ^a		Interpretation of SIR [*]
		Observed	Expected		Lower ^c	Upper	
ALL ^f	495,137	405	383.98	1.06	0.96	1.16	= Same
Al duPont	48,564	28	37.30	0.75	0.51	1.07	= Same
Beebe	47,454	60	34.97	1.72	1.32	2.19	X Worse
Christiana	195,814	181	161.64	1.12	0.97	1.29	= Same
Kent General	73,144	44	55.01	0.80	0.59	1.06	= Same
Milford	36,550	26	27.01	0.96	0.64	1.39	= Same
Nanticoke	21,875	23	14.63	1.57	1.02	2.32	X Worse
St. Francis	18,898	6	14.70	0.41	0.17	0.85	★ Better
Wilmington	52,838	37	38.72	0.96	0.68	1.30	= Same
3b. Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)							
Hospital	Patient Days	Number of Infections		SIR ^b	95% CI ^a		Interpretation of SIR [*]
		Observed	Expected		Lower ^c	Upper	
ALL ^f	538,061	36	35.65	1.01	0.72	1.38	= Same
Al duPont	48,564	1	2.61	0.38	0.02	1.89	= Same
Beebe	47,454	5	2.43	2.06	0.75	4.56	= Same
Christiana	227,987	21	19.75	1.06	0.68	1.60	= Same
Kent General	80,948	5	3.78	1.32	0.48	2.93	= Same
Milford	37,198	2	1.75	1.14	0.19	3.77	= Same
Nanticoke	21,875	1	1.64	0.61	0.03	3.00	= Same
St. Francis	21,197	0	0.79	---	---	---	No Conclusion
Wilmington	52,838	1	2.89	0.35	0.02	1.71	= Same

✖ – Legend			
★ Significantly fewer infections (better) observed than predicted, based on the national baseline.	= No significant difference (same) between the number of observed and predicted infections, based on the national baseline.	✖ Significantly more infections (worse) observed than predicted, based on the national baseline.	No Conclusion The SIR is not calculated when the number of predicted infections is less than 1.

- The number of patient days is a count of the number of patients in a patient care location.
- SIR is only calculated if the expected number is greater than or equal to 1.
- Confidence Limits are the endpoints of the confidence interval, which is a range of values that accounts for random error in estimation of the SIR.
- Lower bound of 95% confidence interval is only calculated if observed number is greater than 0.

Summary

It is important to note that while an SIR of less than 1.0 is a positive finding it does not mean that further improvement cannot be made.²⁰ Steps can be taken to control and prevent healthcare-associated infections in a variety of settings. Research shows that when healthcare facilities, care teams, and individual doctors and nurses are aware of infection problems and take specific steps to prevent them, rates of some targeted can decrease by more than 70 percent.

Notably, the infection rate of a hospital may change from year to year, which may lead to considerable annual variation in the SIR, particularly for a small hospital. For example, if one HAI was diagnosed in a small hospital for 2014 and three diagnosed in 2014, the SIR for that hospital might change dramatically. Such dramatic variation is less likely to affect the SIRs of larger hospitals. Nonetheless, the overall HAI rate for Delaware may fluctuate as a result of the relatively few hospitals that contribute HAI data compared to states with more or larger hospitals.

Full engagement between local, state and federal public health agencies and their partners in the healthcare sector is vital to sustaining and extending HAI surveillance and prevention progress. CDC will continue its prevention, tracking, lab, and guideline work to push the country further toward the goal of eliminating HAIs. Delaware hospitals are working to reduce HAIs through prevention initiatives, surveillance and response activities. To improve outcomes, acute care hospitals have partnered with state hospital associations, professional societies for infection control, academic organizations, laboratorians, long term care facilities and the Delaware Division of Public Health.

²⁰ Centers for Disease Control and Prevention. 2013 National and State Healthcare-Associated Infections Progress Report. Published January 14, 2015. Available at <http://www.cdc.gov/HAI/pdfs/progress-report/hai-progress-report.pdf>.

Appendix A

Delaware Healthcare-Associated Infections Advisory Committee

Name	Position in Code ²¹	Affiliation
Kim Adkins	Hospital Infection Control	Nanticoke Memorial Hospital
Donna Anderson	Hospital Infection Control	Beebe Medical Center
Kelly Gardner (Chair)	Hospital Infection Control	Kent General Hospital (Bayhealth)
Holly Helmick	Hospital Infection Control	Milford Memorial (Bayhealth)
Helene Paxton	Hospital Infection Control	St. Francis Hospital
Eileen Sherman	Hospital Infection Control	AI duPont/Nemours
Jean Stipe	Hospital Infection Control	Wilmington VA Medical Center
Kathleen Wroten	Hospital Infection Control	Christiana Care Health System
Maria Eckart	Infection Control Professional	Genesis Healthcare
Marci Drees, MD	Infectious Disease Physician	Christiana Care Health System
Stephen Eppes, MD	Infectious Disease Physician	Christiana Care Health System
Vacant (2)	Infectious Disease Physician	
Yrene Waldron	Delaware Health Care Facility	Delaware Health Care Facilities Assoc.
Lynn Watts	Freestanding Surgical Center	Eden Hill Medical Center
Ehtesham Hamid	Dialysis	Fresenius Medical Care
Valerie Devereaux	Psychiatric Facility	Delaware Psychiatric Center
Awele Maduka-Ezeh, MD	Medical Director	Division of Public Health
Judy Walrath	HAI Specialist	Division of Public Health
Michele Dennis	Direct Care Nursing Staff	Stonegates Retirement Community
Veronica Wilbur	Academic Researcher	West Chester University
Joann Hasse	Consumer Organization	Self
Vacant	Health Insurer	
Omo Olurin	Health Maintenance Organiz.	Aetna, Inc.
Vacant	Organized Labor	
Robert Reed	Purchaser of Health Care	self
Tracy Wilkins	Correctional Institution	Department of Corrections
Jessica Snow	Purchaser of Health Insurance	self

²¹ As defined by Title 16 Chapter 10A of the Delaware Code.

Appendix B
Hospital Comments (Not for Publication)²²

Delaware Health and Social Services
Division of Public Health
Infectious Disease Prevention and Control Section
Office of Infectious Disease Epidemiology

417 Federal Street
Dover, Delaware, 19901
302-744-4990

²² Title 16 Chapter 10A of the Delaware Code “allows hospitals to comment on performance improvement and changes in patient population and risk factors.” The information contained in this report shall be considered proprietary information and shall be used by the Department (of Health and Social Services) and shall not be made available in the Public Report and shall not be subject to disclosure under the State’s Freedom of Information Act.