DELAWARE HEALTH AND SOCIAL SERVICES
Division of Public Health
Office of Infectious Disease Epidemiology

Delaware Healthcare-Associated Infections Annual Report 2015

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	*Clostridium difficile* (*C. Diff*) 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 *Staphylococcus aureus* infection
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 (HAIs) in Delaware healthcare facilities. The Healthcare-Associated Infections Advisory Committee (HAIAC) was created to oversee implementation of the Healthcare Associated Infections 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] Development and implementation of strategies to reduce and prevent HAIs are a priority for the HAIAC.

Acute care hospitals are required to report catheter-associated urinary tract infections (CAUTIs) and central line-associated bloodstream infections (CLABSIs) from intensive care units (ICUs) and beginning in 2015, from adult and pediatric medical/surgical wards. Surgical site infections (SSIs) are required to be reported for inpatient colon surgeries and abdominal hysterectomies, as are facility-wide methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. Diff*) infections. These infections are a threat to patient safety and are a significant cause of illness and death.

Hospitals are required to report HAIs using the Patient Safety Module of CDCs 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 to an "expected" number of infections that is derived based on 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 result in SIRs that are statistically uninterpretable.

In 2015, the SIR for CLABSIs in all acute care hospitals (ICUs) combined in Delaware was significantly lower than expected (SIR= 0.40, 95% CI=0.27, 0.56). The SIR for CAUTIs in acute care hospitals (ICUs) in Delaware was also significantly lower than expected (SIR=0.63, 95% CI=0.44, 0.86). The SIR for colon surgery SSIs was significantly higher than expected (SIR=1.77, 95% CI=1.38, 2.24). The SIR for SSIs following hysterectomy in Delaware was higher than expected (SIR=1.62, 95% CI=0.94, 2.61) but the difference did not reach statistical significance. For *C. Diff* infections, the SIR did not differ statistically from 1.0 (SIR=1.04, 95% CI=0.94, 1.15) and for MRSA infections, the number of observed infections in Delaware during 2015 was significantly higher than expected (SIR=1.53, 95% CI=1.14, 2.01).

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.

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[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, 2015, through December 31, 2015. 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]

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[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. CMS requires 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 and beginning in January 2015, in adult and pediatric medical/surgery units. **Surgical Site Infections** (SSIs) that occur among adults following colon surgery or abdominal hysterectomy are reported in acute care hospitals. As of January 2013, **MRSA Bacteremia and C. *difficile*** infections 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 30-Day CMS IPPS model that allows facilities to review those SSI data that would be submitted to CMS on their behalf adjusts using the following:

- Patient age
- ASA score - assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Classification of Physical Status[12]

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
[12] https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system

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.[13]

Healthcare Associated Infections Included in this Report

(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.[14] These infections are usually serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality. Most 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.

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.[15] A urinary tract infection (UTI) involves any part of the urinary system including the urethra, bladder, ureters and kidney.

Urinary tract infections (UTIs) are the fourth most common type of healthcare-associated infection, with an estimated 93,300 UTIs in acute care hospitals in 2011 and account for more than 12

[13] Rothman KJ, Greenland S, Lash TL. Study Design and Conduct. Modern Epidemiology. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008.
[14] http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf
[15] http://www.cdc.gov/HAI/ca_uti/uti.html

percent of infections reported by acute care hospitals.[16] Approximately 75-80 percent of UTIs acquired in the hospital are associated with a urinary catheter. CAUTIs can lead to numerous complications that cause discomfort to the patient, prolonged hospital stay and increased cost and mortality.[17] It has been estimated that annually, more than 13,000 deaths are associated with CAUTIs.[18]

(2) Surgical Site Infections

In 2010, an estimated 16 million operative procedures were performed in acute care hospitals in the United States.[19] A recent prevalence study found that surgical site infections (SSIs) were the most common healthcare-associated infection, accounting for 31% of all HAIs among hospitalized patients.[16] The CDC healthcare-associated infection (HAI) prevalence survey found that there were an estimated 157,500 surgical site infections associated with inpatient surgeries in 2011. A 19 percent decrease in SSI related to 10 select procedures was reported between 2008 and 2013.

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.[20]

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 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.[21]

(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.

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

[17] 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.

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

[19] http://www.cdc.gov/nchs/data/nhds/4procedures/2010pro_numberpercentage.pdf

[20] 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

[21] Surgical Site Infection (SSI) Event (January 2016) http://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf

Clostridium difficile Infection (*C. Diff*)

Clostridium difficile infection (CDI), also known as *C. difficile, C. diff* or CDAD (*Clostridium difficile*-associated disease), is a bacterium that causes inflammation of the colon. 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 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.[22]

Methicillin-resistant *Staphylococcus aureus* (MRSA)

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

Results - Acute Care Hospitals

(1) Device-Related HAIs

Central Line-Associated Bloodstream Infection (CLABSI)

The standardized infection ratio (SIR) for CLABSIs in Delaware ICUs was lower than the standard population, with an SIR of 0.40 (Table 1a). The 95% CI for this estimate was 0.27 to 0.56, which indicates that the result is statistically significant because it excludes 1.0. Estimated SIRs for Christiana and AI duPont were lower than expected and were based on relatively large numbers of device days. SIRs for the other hospitals (Beebe, Kent General, Milford, Nanticoke, St. Francis and Wilmington) were lower than expected but these SIR estimates were too imprecise to interpret accurately.

Catheter-Associated Urinary Tract Infection (CAUTI)

The standardized infection ratio (SIR) for CAUTIs in Delaware was 0.63 (Table 1b), which is interpreted as 37 percent fewer infections than predicted. The SIR for Christiana Hospital was lower than expected, but the confidence interval did include 1.0 (0.42, 1.03). Small numbers of device days contributed to imprecise SIR estimates, making results difficult to interpret for the other Delaware hospitals.

[22] http://www.cdc.gov/HAI/organisms/cdiff/Cdiff_infect.html

Table 1. Standardized Infection Ratios (SIR) for Device-Related HAIs (CLABSIs and CAUTIs) by Delaware Acute Care Hospital, January 1 – December 31, 2015

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]	**33,496**	**30**	**75.64**	**0.40**	**0.27**	**0.56**	★ Better
Al duPont	**8,173**	10	22.89	0.44	0.22	0.78	★ Better
Beebe	**3,732**	2	5.60	0.36	0.06	1.18	= Same
Christiana	**13,853**	14	34.12	0.41	0.23	0.67	★ Better
Kent General	**3,391**	3	5.45	0.55	0.14	1.49	= Same
Milford	**1,075**	0	1.61	0.00	---	1.86	= Same
Nanticoke	**1,114**	0	1.67	0.00	---	1.79	= Same
St. Francis	**1,232**	0	2.34	0.00	---	1.28	= Same
Wilmington	**926**	1	1.95	0.51	0.03	2.54	= Same
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]	**24,441**	**34**	**54.41**	**0.63**	**0.44**	**0.86**	★ Better
Al duPont	**1,999**	6	5.53	0.79	0.44	2.26	= Same
Beebe	**4,027**	5	4.83	1.04	0.38	2.29	= Same
Christiana	**9,801**	19	28.19	0.67	0.42	1.03	= Same
Kent General	**4,004**	3	8.18	0.37	0.09	1.00	= Same
Milford	**1,296**	1	1.69	0.59	0.03	2.93	= Same
Nanticoke	**1,269**	0	1.65	0.00	---	1.82	= Same
St. Francis	**1,195**	0	2.39	0.00	---	1.25	= Same
Wilmington	**850**	0	1.96	0.00	---	1.53	= 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 endpoints of the confidence interval, 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.
NOTE: Data contained in this report were generated on July 31, 2016.

(2) Surgical Site Infections

Colon Surgery

Among Delaware acute care hospitals in 2015, there were 77 percent more SSIs related to colon surgery than predicted (SIR = 1.77, Table 2a) and the SIR estimate is statistically significant. The SIR was significantly higher than expected for three hospitals; Christiana (SIR = 1.80, 95% CI = (1.29, 2.45)), Milford (SIR = 2.97, 95% CI = (1.20, 6.18)) and Wilmington (SIR = 5.76, 95% CI = (3.12, 9.79)) Hospitals. For the other four Delaware hospitals, numbers of predicted infections were small and

the SIR estimates did not differ from 1.0.

Abdominal Hysterectomy

There 62 percent more SSIs related to abdominal hysterectomies than expected (SIR = 1.62, Table 2b) in Delaware acute care hospitals but this estimate was not statistically significant as the 95% CI includes 1.0. The SIRs for Christiana and Kent General did not differ from 1.0. SIRs could not be calculated for Beebe, Milford, Nanticoke, St. Francis and Wilmington Hospitals.

Table 2. Standardized Infection Ratios (SIRs) for Surgical Site Infections (SSIs) by Delaware Acute Care Hospital, January 1 – December 31, 2015

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]	**1,140**	**65**	**36.78**	**1.77**	**1.38**	**2.24**	**X Worse**
Beebe	**134**	1	4.03	**0.25**	0.01	1.22	**= Same**
Christiana	**645**	38	21.09	**1.80**	1.29	2.45	**X Worse**
Kent General	**151**	6	4.99	**1.20**	0.49	2.50	**= Same**
Milford	**65**	6	2.02	**2.97**	1.20	6.18	**X Worse**
Nanticoke	**42**	0	1.29	**0.00**	---	1.29	**= Same**
St. Francis	**40**	2	1.28	**1.56**	0.26	5.16	**= Same**
Wilmington	**63**	12	2.09	**5.76**	3.12	9.79	**X Worse**
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]	**961**	**15**	**9.27**	**1.62**	**0.94**	**2.61**	**= Same**
Beebe	**51**	1	0.46	**---**	---	---	**No Conclusion**
Christiana	**545**	9	5.39	**1.67**	0.81	3.07	**= Same**
Kent General	**165**	2	1.58	**1.26**	0.21	4.17	**= Same**
Milford	**22**	0	0.21	**---**	---	---	**No Conclusion**
Nanticoke	**54**	0	0.46	**---**	---	---	**No Conclusion**
St. Francis	**37**	1	0.38	**---**	---	---	**No Conclusion**
Wilmington	**87**	2	0.79	**---**	---	---	**No Conclusion**

* – 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. 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.
b. SIR is only calculated if the expected number is greater than or equal to 1.
c. Confidence Limits are endpoints of the confidence interval, 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.
e. AI 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).
NOTE: Data contained in this report were generated on July 31, 2016.

(3) Hospital-Onset Laboratory-Identified Events

Clostridium difficile Infection (*C. Diff*)

The number of *C. Diff* infections in Delaware was not statistically different from 1.00, with an SIR = 1.04 and 95% CI that ranged from 0.94 to 1.14 (Table 3a). The SIR for Beebe Hospital was significantly elevated (SIR = 1.97, 95% CI = (1.53, 2.51)). The SIRs for all other hospitals did not differ statistically from 1.00.

Table 3. Standardized Infection Ratios (SIRs) for *C. Diff* and MRSA, Delaware Acute Care Hospitals, January 1 – December 31, 2015

Hospital-Onset Laboratory-Identified Events							
3a. *Clostridium difficile* (*C. Diff*)							
Hospital	**Patient Days**	**Number of Infections**		**SIR[b]**	**95% CI[a]**		**Interpretation of SIR⁑**
		Observed	**Expected**		**Lower[c]**	**Upper**	
ALL[f]	**462,587**	**401**	**386.03**	**1.04**	**0.94**	**1.14**	= Same
Al duPont	**45,363**	30	36.11	**0.83**	0.57	1.17	= Same
Beebe	**44,478**	62	31.44	**1.97**	1.53	2.51	X Worse
Christiana	**195,922**	181	179.39	**1.01**	0.87	1.16	= Same
Kent General	**72,796**	52	58.13	**0.90**	0.68	1.16	= Same
Milford	**23,729**	21	18.30	**1.15**	0.73	1.72	= Same
Nanticoke	**20,299**	11	9.03	**0.50**	0.64	2.12	= Same
St. Francis	**17,951**	16	18.65	**0.86**	0.51	1.36	= Same
Wilmington	**42,049**	28	34.98	**0.80**	0.54	1.14	= Same
3b. Methicillin-resistant *Staphylococcus aureus* (MRSA)							
Hospital	**Patient Days**	**Number of Infections**		**SIR[b]**	**95% CI[a]**		**Interpretation of SIR⁑**
		Observed	**Expected**		**Lower[c]**	**Upper**	
ALL[f]	**508,628**	**48**	**31.51**	**1.52**	**1.14**	**2.00**	X Worse
Al duPont	**46,990**	0	2.39	**0.00**	---	1.25	= Same
Beebe	**44,478**	2	2.37	**0.84**	0.14	2.79	= Same
Christiana	**230,749**	36	18.68	**1.93**	1.37	2.64	X Worse
Kent General	**80,015**	4	3.04	**1.31**	0.42	3.17	= Same
Milford	**24,397**	1	0.98	**---**	---	---	**No Conclusion**
Nanticoke	**20,299**	5	1.05	**4.75**	1.74	10.53	X Worse
St. Francis	**19,651**	0	0.70	**---**	---	---	**No Conclusion**
Wilmington	**42,049**	0	2.29	**0.00**	0.02	1.31	= 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. The number of patient days is a count of the number of patients in a patient care location.
b. SIR is only calculated if the expected number is greater than or equal to 1.
c. Confidence Limits are endpoints of the confidence interval, 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.
NOTE: Data contained in this report were generated on July 31, 2016.

Methicillin-resistant *Staphylococcus aureus* (MRSA)

The total number of healthcare-associated cases of MRSA (HA-MRSA) infection in Delaware during 2015 was 52 percent higher than expected (SIR = 1.52) with 48 infections compared with 31.5 expected (Table 3b). The number of MRSA infections was statistically higher than expected at both Christiana Hospital (SIR = 1.93) and at Nanticoke Memorial Hospital (SIR = 4.75). At AI duPont, Beebe, Kent General and Wilmington Hospitals, the SIR for MRSA infections did not differ statistically from 1.00.

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.[23] 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 2015 and three diagnosed in 2015, 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.

[23] 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[24]	Affiliation
Kim Adkins	Hospital Infection Control	Nanticoke Memorial Hospital
Beth Richardson	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
Lydia Edwards	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
Alfredo Sagisi	Dialysis	Fresenius Medical Care
Vacant	Psychiatric Facility	Delaware Psychiatric Center
Awele Maduka-Ezeh, MD	Medical Director	Division of Public Health
Judy Walrath	HAI Specialist	Division of Public Health
Vacant	Direct Care Nursing Staff	Stonegates Retirement Community
Veronica Wilbur	Academic Researcher	West Chester University
Maureen Tomczak	Consumer	Self
Vacant	Health Insurer	
Omo Olurin	Health Maintenance Organiz.	Aetna, Inc.
Vacant	Organized Labor	
Robert Reed	Purchaser of Health Care	self
Ashley Istenes	Correctional Institution	Department of Corrections
Jessica Snow	Purchaser of Health Insurance	self

[24] As defined by Title 16 Chapter 10A of the Delaware Code.

Appendix B
Hospital Comments (Not for Publication) [25]

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

[25] 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.