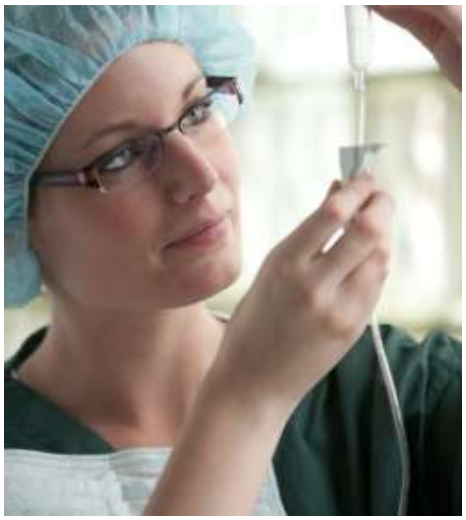
***DELAWARE HEALTH AND SOCIAL SERVICES***
**Division of Public Health**
**Office of Infectious Disease Epidemiology**

# Delaware Healthcare-Associated Infections Annual Report 2013



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

June 2015

# Table of Contents

## 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-Susceptible *Staphylococcus aureus* |
| 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-susceptible *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 2013, 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= 0.59, 95% CI=0.43, 0.79). The SIR for CAUTIs in acute care hospitals (ICUs) in Delaware was significantly higher than the rate of CAUTIs in similar hospitals in the U.S. (SIR=1.49, 95% CI=1.18, 1.85). The SIR for colon surgery SSIs was significantly lower than the rate of SSIs in similar hospitals in the U.S. (SIR=0.67, 95% CI=0.44, 0.98). The SIR for hysterectomy SSIs in Delaware did not differ statistically from the rate of SSIs in similar hospitals in the U.S. (SIR=0.87, 95% CI=0.44, 1.54). The SIR for *C. Diff* infections also did not differ statistically from 1.0 (SIR=1.04, 95% CI=0.94, 1.15) and for MRSA the number of observed infections in Delaware during 2013 also did not differ statistically from the number expected (SIR=1.20, 95% CI=0.88, 1.61).

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

# Delaware Healthcare-Associated Infections Annual Report 2013

## 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, 2013, through December 31, 2013. 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-onset" 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 0.59 (Table 1a). The 95% CI for this estimate was 0.43 to 0.79, 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 a relatively large number 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 1.49 (Table 1b), which is interpreted as 49 percent more infections than predicted. This SIR is statistically significant, based on the 95% CI of 1.18 to 1.85. SIRs for Kent General and AI duPont were higher than expected and the SIR for Christiana Hospital was modestly higher than expected. For the remaining five hospitals, small numbers of devices contributed to imprecise SIR estimates, making it 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, 2013**

| 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] | 30.746 | 43 | 72.60 | 0.59 | 0.43 | 0.79 | ★ Better |
| AI duPont | 7,103 | 16 | 20.73 | 0.77 | 0.46 | 1.23 | = Same |
| Beebe | 3,294 | 3 | 4.94 | 0.61 | 0.15 | 1.65 | = Same |
| Christiana | 12,757 | 15 | 34.66 | 0.43 | 0.25 | 0.70 | ★ Better |
| Kent General | 2,903 | 7 | 4.30 | 1.63 | 0.71 | 3.22 | = Same |
| Milford | 1,074 | 0 | 1.61 | 0.00 | --- | 1.86 | = Same |
| Nanticoke | 1,617 | 1 | 1.23 | 0.41 | 0.02 | 2.03 | = Same |
| St. Francis | 1,233 | 1 | 2.34 | 0.43 | 0.02 | 2.11 | = Same |
| Wilmington | 765 | 0 | 1.61 | 0.00 | --- | 1.87 | = 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] | **24,025** | 75 | 50.45 | 1.49 | 1.18 | 1.85 | **X Worse** |
| **Al duPont** | **2,201** | 10 | 6.10 | 1.64 | 0.83 | 2.92 | **= Same** |
| **Beebe** | **3,364** | 0 | 4.04 | 0.00 | --- | 1.74 | **= Same** |
| **Christiana** | **9,940** | 34 | 26.9 | 1.26 | 0.89 | 1.75 | **= Same** |
| **Kent General** | **3,426** | 15 | 4.88 | 3.07 | 1.79 | 4.95 | **X Worse** |
| **Milford** | **1,078** | 5 | 1.40 | 3.57 | 1.31 | 7.91 | **X Worse** |
| **Nanticoke** | **1,769** | 7 | 2.3 | 3.04 | 1.33 | 6.02 | **X Worse** |
| **St. Francis** | **1,131** | 2 | 2.26 | 0.88 | 0.15 | 2.92 | **= Same** |
| **Wilmington** | **1,116** | 2 | 2.57 | 0.78 | 0.13 | 2.57 | **= 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 2013, there were 33 percent fewer SSIs related to colon surgery than predicted (SIR = 0.67) (Table 2a). This SIR estimate is statistically significant. Although numbers of predicted infections were small, both Beebe and Nanticoke had significantly low SIRs. SIRs for Christiana, Kent General, Milford and St. Francis Hospitals did not differ from 1.0.

### Abdominal Hysterectomy

There were 13 percent fewer SSIs for abdominal hysterectomies than expected (SIR = 0.87) but this estimate was not statistically significant as the 95% CI = (0.44, 1.54) includes 1.0. The SIRs for Christiana, Kent General and St. Francis Hospitals did not differ from 1. SIRs could not be calculated for Beebe, Milford, Nanticoke and Wilmington Hospitals.

**Table 2. Surgical Site Infection (SSI) Standardized Infection Ratio (SIR) Report by Surgery Type, Delaware Acute Care Hospitals, January 1 – December 31, 2013**

| 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]** | **1,112** | 24 | 35.90 | **0.67** | 0.44 | 0.98 | ★ **Better** |
| **Beebe** | **134** | 0 | 3.96 | **0.00** | --- | 0.76 | ★ **Better** |
| **Christiana** | **669** | 18 | 21.84 | **0.82** | 0.50 | 1.28 | = **Same** |
| **Kent General** | **142** | 4 | 4.61 | **0.87** | 0.28 | 2.09 | = **Same** |
| **Milford** | **48** | 1 | 1.53 | **0.65** | 0.03 | 3.22 | = **Same** |
| **Nanticoke** | **64** | 0 | 2.09 | **0.00** | --- | 0.12 | ★ **Better** |
| **St. Francis** | **34** | 0 | 1.12 | **0.00** | --- | 2.68 | = **Same** |
| **Wilmington** | **21** | 1 | 0.74 | **---** | --- | --- | **No Conclusion** |
| **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]** | **1,197** | 10 | 11.55 | **0.87** | 0.44 | 1.54 | = **Same** |
| **Beebe** | **40** | 0 | 0.32 | **---** | --- | --- | **No Conclusion** |
| **Christiana** | **743** | 6 | 7.20 | **0.83** | 0.34 | 1.73 | = **Same** |
| **Kent General** | **178** | 3 | 1.73 | **0.35** | 0.44 | 4.72 | = **Same** |
| **Milford** | **41** | 1 | 0.43 | **---** | --- | --- | **No Conclusion** |
| **Nanticoke** | **51** | 0 | 0.51 | **---** | --- | --- | **No Conclusion** |
| **St. Francis** | **107** | 0 | 1.01 | **0.00** | --- | 2.98 | = **Same** |
| **Wilmington** | **37** | 0 | 0.36 | **---** | --- | --- | **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 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.
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).

## (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 in 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 = 1.04 and 95% CI = 0.94, 1.15 (Table 3a). The SIR estimate for Kent General was significantly lower than expected (SIR = 0.68, 95% CI = 0.48, 0.93). SIRs for *C. Diff* infections in the seven other 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 certain antibiotics called beta-lactams. These antibiotics include methicillin and other more common antibiotics such as oxacillin or nafcillin. In the community, most MRSA infections are skin infections. More severe or potentially life-threatening MRSA infections occur most frequently among patients in healthcare settings.

For MRSA, there were 20 percent more infections in Delaware during 2013 than expected (SIR = 1.20) but this SIR estimate was not significantly different from 1.0 (95% CI = 0.88, 1.61). The SIRs for

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

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, 2013**

| Hospital-Onset Laboratory-Identified Events | | | | | | | |
|---|---|---|---|---|---|---|---|
| **3a. *Clostridium difficile* Infection (*C. Diff*)** | | | | | | | |
| **Hospital** | **Patient Days** | **Number of Infections** | | **SIR[b]** | **95% CI[a]** | | **Interpretation of SIR[*]** |
| | | **Observed** | **Expected** | | **Lower[c]** | **Upper** | |
| **ALL[f]** | **455,162** | 387 | 372.6 | **1.04** | 0.94 | 1.15 | = Same |
| **Al duPont** | **29,836** | 16 | 23.43 | **0.68** | 0.40 | 1.09 | = Same |
| **Beebe** | **38,973** | 32 | 27.44 | **1.17** | 0.81 | 1.63 | = Same |
| **Christiana** | **191,384** | 200 | 180.21 | **1.11** | 0.96 | 1.27 | = Same |
| **Kent General** | **67,632** | 35 | 51.84 | **0.68** | 0.48 | 0.93 | ★ Better |
| **Milford** | **34,201** | 30 | 23.44 | **1.28** | 0.88 | 1.80 | = Same |
| **Nanticoke** | **23,493** | 15 | 15.86 | **0.95** | 0.55 | 1.53 | = Same |
| **St. Francis** | **20,188** | 13 | 14.05 | **0.93** | 0.52 | 1.54 | = Same |
| **Wilmington** | **49,455** | 46 | 36.32 | **1.27** | 0.94 | 1.68 | = 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]** | **492,597** | 43 | 35.75 | **1.20** | 0.88 | 1.61 | = Same |
| **Al duPont** | **30,272** | 4 | 1.56 | **2.57** | 0.82 | 6.20 | = Same |
| **Beebe** | **39,402** | 2 | 2.40 | **0.84** | 0.14 | 2.76 | = Same |
| **Christiana** | **221,981** | 27 | 20.52 | **1.32** | 0.89 | 1.89 | = Same |
| **Kent General** | **70,922** | 5 | 3.31 | **1.51** | 0.55 | 3.35 | = Same |
| **Milford** | **34,596** | 4 | 1.61 | **2.49** | 0.79 | 6.00 | = Same |
| **Nanticoke** | **23,708** | 0 | 1.61 | **0.00** | --- | 1.86 | = Same |
| **St. Francis** | **22,261** | 0 | 0.91 | **---** | --- | --- | **No Conclusion** |
| **Wilmington** | **49,455** | 1 | 3.84 | **0.26** | 0.01 | 1.29 | = 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 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.

## 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 2012 and three diagnosed in 2013, 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 | Wilmington 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]

[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.

**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