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

Delaware Healthcare-Associated Infections Annual Report 2018

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
LTAC	Long-Term Acute Care Hospital
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 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 a "predicted" or 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 2018, there were 40 CLABSIs reported for all acute care hospitals combined which was significantly lower than predicted (SIR = 0.61, 95% CI = (0.44, 0.82)). The SIR for CAUTIs in acute care hospitals in Delaware was also significantly lower than 1.00 (SIR = 0.64, 95% CI = (0.45, 0.89)), with 33 infections compared with 51.7 predicted. There were 14 SSIs following colon surgery with 30.3 predicted, and the SIR was significantly lower than 1.00 (SIR = 0.46, 95% CI = (0.26, 0.76)). The SIR for SSIs following abdominal hysterectomy was not statistically different from 1.00 (SIR = 1.54, 95% CI = (0.78, 2.74)). For *C. Diff* infections, the SIR was significantly lower than 1.00 (SIR = 0.68, 95% CI = (0.60, 0.77)). The number of observed MRSA infections was similar to the number predicted (SIR = 1.02, 95% CI = (0.74, 1.36)).

It is important to note that healthcare facilities in Delaware continue to implement prevention initiatives to continue to reduce the 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, 2018, through December 31, 2018. As required by law, this annual report is published alongside quarterly reports on the Delaware Division of Public Health HAI website (https://dhss.delaware.gov/dph/epi/haihomepage.html) 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 HAIAC assisted DHSS in the development of regulations, reviewed NHSN requirements and selected reporting requirements for Delaware.[7]

Reporting HAIs in Delaware

All eight acute care hospitals in Delaware 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

[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

September 1, 2013.[8]

This report includes data on the following types of healthcare-associated infections:
(1) **Device-Related Infections** that occur in adult, pediatric and neonatal intensive care units (ICUs) and adult and pediatric medical/surgery units at acute care hospitals in Delaware:

(a) catheter-associated urinary tract infections (CAUTIs) and
(b) central line-associated bloodstream infections (CLABSIs),

(2) **Surgical Site Infections** (SSIs) that occur among adults in acute care hospitals following

(a) colon surgery or
(b) abdominal hysterectomy,

(3) **Hospital-Onset Laboratory-Identified Events** that occur in acute care hospitals:

(a) Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and
(b) Clostridium *difficile* (C. *Diff).*

Methods

Infection Preventionists (IPs) at acute care hospitals in Delaware are required to report infections listed above to the NHSN using standardized definitions. For each type of infection, the IPs report the number of patients with infections (numerator) and the denominator, which are either the number of patients with a given device (device days), number of surgeries (procedures) or total number of patients at risk (patient days).

The **standardized infection ratio (SIR)** is calculated as the total number of observed infections divided by the total number of predicted iinfections. The SIR, a summary measure used to track HAI prevention progress over time, compares the number of infections reported in a facility or state to the number of infections that were "predicted" or would be expected to have occurred based on previous years of reported data (i.e. baseline data).

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

The number of predicted infections is an estimate based on aggregate data reported to CDC's NHSN during a specific historical baseline period. The predicted number is adjusted for risk factors that could impact the number of infections reported by a hospital, such as type of patient location, bed size of the hospital and patient age, and are adjusted differently depending on the type of infection measured as shown below.[9] When data are risk-adjusted, it makes it possible to fairly compare hospital performance. The **2015 Rebaseline** is a term that CDC's National Healthcare Safety Network

[8] http://www.cdc.gov/nhsn/PDFs/CMS/CMS-Reporting-Requirements.pdf
[9] http://www.cdc.gov/HAI/surveillance/QA_stateSummary.html#b7

(NHSN) staff uses to describe updates to the original HAI baselines. The 2015 Rebaseline updates both the source of aggregate data and the risk adjustment methodology used to create the original baselines. For acute care hospitals:

SIRs for CLABSIs and CAUTIs are adjusted for the following potential risk factors for infection:

- facility bed size,
- medical school affiliation,
- status as a cancer hospital and
- ICU location.

SIRs for SSIs are presented using CDC's Complex 30-Day CMS IPPS model that allows facilities to review SSI data that would be submitted to CMS on their behalf and adjusts for:

- status as a cancer hospital and
- patient factors: age, gender, ASA Score[10], Body Mass Index, closure technique, diabetes and type of surgery.

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,
- number of patients admitted to the hospital who already have *C. difficile* or a MRSA bloodstream infection (community-acquired cases) and
- for C. *difficile*, the type of test the hospital laboratory uses to identify C. *difficile* from patient specimens.

Interpretation of the Standardized Infection Ratio (SIR)

Calculation of the SIR will result in one of the following:

- **The SIR is less than 1.0** – indicates that there were fewer infections reported during the surveillance period than would have been predicted given the baseline data. This result is noted in data tables as: ★ **Better**
- **The SIR is equal to 1.0** – indicates that the numerator and denominator are relatively equal. In this instance, the number of infections reported during the surveillance period is the same as the number predicted given the baseline data. This result is noted in data tables as: **= Same**
- **The SIR is greater than 1.0** – indicates that there were more infections reported during the surveillance period than would have been predicted given the baseline data. This result is noted in data tables as: **x Worse**
- The SIR is not calculated when the predicted number of infections is less than 1.0, which is due to a small number of device days, procedures or patient days.

[10] ASA score - assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Classification of Physical Status. https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system

Confidence Interval of the Standardized Infection Ratio (SIR)

Since the SIR is only an estimate of the "true" value, confidence intervals (CI) are provided which indicate the range of values within 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 there is 95 percent confidence that the true SIR falls between the upper and lower limits of the CI.[11]

Results - Healthcare Associated Infections

(1) Device-Related HAIs

Central Line-Associated Bloodstream Infections (CLABSIs)

A central line is a tube placed into a patient's large vein or artery, usually in the neck, chest, arm or groin. The catheter is used to draw blood, provide fluids, or 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. Based on 2014 data, an estimated 30,100 central line-associated bloodstream infections (CLABSIs) occur in intensive care units and wards of U.S. acute care facilities annually.[12] These infections are usually serious, typically causing a prolongation of hospital stay, increased costs and greater risk of mortality. Most CLABSIs can be prevented through proper insertion and management of the central line. Since 2008, U.S. hospitals have made significant progress in preventing CLABSIs, with a roughly 50 percent decline in CLABSIs from 2008 through 2016.[13]

In Table 1a below are results for CLABSIs for each Delaware acute care hospital and all acute care hospitals combined for 2018. The table contains the total number of central line device days (sum of the daily number of patients in a patient care location with a central line), numbers of infections observed and predicted, the standardized infection ratio (SIR) and corresponding 95% confidence interval (95% CI). The SIR for CLABSIs in Delaware acute care hospitals is 0.61, with 40 infections observed and 66.0 predicted. The SIR was statistically lower than 1.0 since the 95% CI does not include 1.0 (0.44, 0.82). The SIR for Christiana Hospital was significantly lower than 1.0 (SIR = 0.65, 95% CI = (0.42, 0.96)). Estimated SIRs for the other acute care hospitals show no statistically

[11] Rothman KJ, Greenland S, Lash TL. Study Design and Conduct. Modern Epidemiology. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008.
[12] http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf
[13] Healthcare-associated Infections in the United States, 2006-2016: A Story of Progress. https://www.cdc.gov/hai/surveillance/data-reports/data-summary-assessing-progress.html

significant difference between the observed and predicted numbers of CLABSIs or could not be calculated (Milford Memorial Hospital).

Table 1a. Central Line-Associated Bloodstream Infections (CLABSIs) by Delaware Acute Care Hospital, January 1 – December 31, 2018

Hospital	Central Line Device Days[a]	Number of Infections		SIR[b]	95% CI[c]		Interpretation of SIR[✱]
		Observed	Predicted		Lower[d]	Upper	
ALL[f]	**61,784**	**40**	**66.00**	**0.61**	**0.44**	**0.82**	★ **Better**
Al duPont	**10,014**	14	12.65	**1.11**	0.63	1.81	= Same
Beebe	**4,145**	1	2.98	**0.34**	0.02	1.66	= Same
Christiana	**31,359**	23	35.36	**0.65**	0.42	0.96	★ **Better**
Kent General	**5,853**	0	6.14	**0.00**	---	1.49	= Same
Milford	**1,048**	0	0.99	**0.00**	---	---	**No Conclusion**
Nanticoke	**2,290**	1	1.60	**0.63**	0.03	3.08	= Same
St. Francis	**3,024**	0	2.74	**0.00**	---	1.09	= Same
Wilmington	**4,051**	1	3.54	**0.28**	0.01	1.39	= Same

✱ – Legend

★ Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	= No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.	**No Conclusion** SIR is not calculated when number of predicted infections is less than 1.0.

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 predicted 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 May 26, 2019.

Catheter-Associated Urinary Tract Infections (CAUTIs)

Approximately 12 to 16 percent of adult hospitalized patients will have a urinary catheter, a tube inserted into the bladder through the urethra to drain urine, during their hospital stay.[14] A catheter-associated urinary tract infection (CAUTI) involves infection in any part of the urinary system including urethra, bladder, ureters and kidney.

In 2011, urinary tract infections (UTIs) were the fourth most common healthcare-associated infection with an estimated 93,300 UTIs in acute care hospitals, and accounted for more than 12 percent of reported infections.[15] Approximately 75-80 percent of UTIs acquired in the hospital are associated with a urinary catheter. CAUTIs can lead to numerous complications causing discomfort to the patient, prolonged hospital stay or increased mortality.[16] Estimates show that in the U.S., more than

[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.

13,000 deaths are associated with CAUTIs annually.[17] There has been a steady decline in CAUTIs noted over the past few years with improvements primarily in non-ICU locations, but recent years have seen progress in ICUs as well.[15]

In Table 1b are results for CAUTIs in Delaware, with numbers of device days by hospital; in this instance the count of patients with a urinary catheter in a patient care location during a specific time period. Overall, the standardized infection ratio (SIR) for CAUTIs in Delaware during 2018 was 0.64, which is significantly lower than 1.0, with 33 infections observed and 51.7 predicted (95% CI= (0.45, 0.89)). For each of the other acute care hospitals, the estimated SIR shows no significant difference between the observed and predicted numbers of CAUTIs.

Table 1b. Catheter-Associated Urinary Tract Infections (CAUTIs) by Delaware Acute Care Hospital, January 1 – December 31, 2018

Hospital	Urinary Catheter Device Days[a]	Number of Infections		SIR[b]	95% CI[c]		Interpretation of SIR[✖]
		Observed	Predicted		Lower[d]	Upper	
ALL[f]	**38,676**	**33**	**51.72**	**0.64**	**0.45**	**0.89**	★ **Better**
Al duPont	**1,484**	2	1.61	**1.24**	0.21	4.09	= Same
Beebe	**3,789**	2	2.70	**0.74**	0.12	2.45	= Same
Christiana	**18,166**	20	28.54	**0.70**	0.44	1.06	= Same
Kent General	**6,962**	6	11.11	**0.54**	0.22	1.12	= Same
Milford	**1,360**	0	1.42	**0.00**	---	2.11	= Same
Nanticoke	**2,480**	0	1.71	**0.00**	---	1.74	= Same
St. Francis	**2,582**	0	2.69	**0.00**	---	1.12	= Same
Wilmington	**1,853**	3	1.92	**1.56**	0.40	4.26	= Same

✖ – **Legend**

★ Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	= No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.	**No Conclusion** SIR is not calculated when number of predicted infections is less than 1.0.

e. Device day is a count of patients with a specific device in the patient care location during a time period.
f. SIR is only calculated if the predicted number is greater than or equal to 1.
g. Confidence Limits are endpoints of the confidence interval, a range of values that accounts for random error in estimation of the SIR.
h. 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 May 26, 2019.

(2) Surgical Site Infections

In 2010, an estimated 16 million operative procedures were performed in acute care hospitals in the United States.[18] 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] CDC's 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 SSIs related to 10 select procedures was reported from 2008 through 2013.

[17] Klevens, RM., Edward, JR., et al. "Estimating Healthcare-associated Infections and Deaths in U.S. Hospitals." *Public Health Reports* 122: (2007):160-166.
[18] http://www.cdc.gov/nchs/data/nhds/4procedures/2010pro_numberpercentage.pdf

All inpatient surgical procedures performed that are assigned one or more specific ICD-9-CM and corresponding CPT codes by CDC that comprise "abdominal hysterectomy" and "colon surgery" procedures must be monitored for SSIs and included in SSI data submitted to NHSN.[19]

SSIs required to be reported to CMS include only deep incisional primary and organ/space infections that are routinely detected during the operative hospitalization or upon readmission to a hospital. These criteria avoid penalizing hospitals with more complete reporting as opposed to truly higher infection rates, since superficial SSIs may never come to the attention of hospital Infection Preventionists. Only SSIs with an onset within 30 days of the procedure and SSIs identified in patients who were 18 years or older at time of surgery are included in data CDC reports to CMS.[20]

Colon Surgery

The number of observed infections associated with colon surgeries was significantly lower than the number predicted for Delaware acute care hospitals in 2018 (SIR = 0.46, 95% CI = (0.26, 0.76)), with 14 infections observed compared with 30.3 predicted (Table 2a). For Christiana Hospital, the number of colon surgery SSIs was significantly lower than predicted (SIR = 0.35, 95% CI = (0.14, 0.72)). For other Delaware hospitals, the SIR estimates did not differ from 1.0 or could not be calculated (Milford Memorial and Nanticoke Hospitals).

Table 2a. Surgical Site Infections (SSIs) Associated with Colon Surgery by Delaware Acute Care Hospital, January 1 – December 31, 2018

Hospital	Inpatient Procedures[a]	Number of Infections		SIR[b]	95% CI[c]		Interpretation of SIR*
		Observed	Predicted		Lower[d]	Upper	
ALL[e]	**1,105**	**14**	**30.29**	**0.46**	**0.26**	**0.76**	★ Better
Beebe	**183**	2	4.52	**0.44**	0.07	1.46	= Same
Christiana	**611**	6	17.35	**0.35**	0.14	0.72	★ Better
Kent General	**136**	4	3.56	**1.12**	0.36	2.71	= Same
Milford	**36**	2	0.97	**---**	---	---	**No Conclusion**
Nanticoke	**35**	0	0.95	**---**	---	---	**No Conclusion**
St. Francis	**39**	0	1.04	**0.00**	---	2.89	= Same
Wilmington	**65**	0	1.90	**0.00**	---	1.58	= Same

*** – Legend**

★	Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	=	No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X	Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.
No Conclusion	SIR is not calculated when number of predicted infections is less than 1.0.				

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 predicted 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 May 26, 2019.

[19] 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
[20] Surgical Site Infection (SSI) Event (January 2016) http://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf

.Abdominal Hysterectomy

The number of SSIs related to abdominal hysterectomies did not differ from that predicted (SIR = 1.54, Table 2b) for all Delaware acute care hospitals combined (95% CI = (0.78, 2.74)). The SIR for Christiana Hospital did not differ from 1.0 (SIR = 1.84, (95% CI = (0.80, 3.63). SIRs were not calculated for the remaining hospitals since the number of predicted infections for each was less than 1.0.

Table 2b. Surgical Site Infections (SSIs) Associated with Abdominal Hysterectomy by Delaware Acute Care Hospital, January 1 – December 31, 2018

Hospital	Inpatient Procedures[a]	Number of Infections		SIR[b]	95% CI[c]		Interpretation of SIR[x]
		Observed	Predicted		Lower[d]	Upper	
ALL[e]	**775**	**10**	**6.51**	**1.54**	**0.78**	**2.74**	= Same
Beebe	**39**	2	0.31	**---**	---	---	**No Conclusion**
Christiana	**447**	7	3.81	**1.84**	0.80	3.63	= Same
Kent General	**104**	0	0.87	**---**	---	---	**No Conclusion**
Milford	**39**	0	0.33	**---**	---	---	**No Conclusion**
Nanticoke	**35**	0	0.33	**---**	---	---	**No Conclusion**
St. Francis	**68**	0	0.53	**---**	---	---	**No Conclusion**
Wilmington	**43**	1	0.33	**---**	---	---	**No Conclusion**

x – Legend

★ Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	= No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.	**No Conclusion** SIR is not calculated when number of predicted infections is less than 1.0.

f. 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.
g. SIR is only calculated if the predicted number is greater than or equal to 1.
h. Confidence Limits are endpoints of the confidence interval, a range of values that accounts for random error in estimation of the SIR.
i. Lower bound of 95% confidence interval is only calculated if observed number is greater than 0.
j. 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 May 26, 2019.
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(3) Hospital-Onset Laboratory-Identified Events

Laboratory-Identified (LabID) event reporting enables laboratory testing data to be used without clinical evaluation of the patient, allowing for a 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 patients in whom they suspect *C. difficile* disease, this test is probably over-utilized.

Clostridium difficile Infection (*C. Diff*)

Clostridium difficile infection, also known as *C. difficile, C. diff*, 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 approximately 435,000 infections in the United States in 2011 and

29,000 died within 30 days of initial diagnosis.[21] 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]

The number of *C. Diff* infections in Delaware was significantly lower than predicted with an SIR = 0.68 and a 95% CI that ranged from 0.60 to 0.77 (Table 3a). The SIR was significantly lower than 1.0 for Christiana Hospital (SIR = 0.47, 95% CI = (0.37, 0.58)) and for St. Francis Hospital (SIR = 0.30, 95% CI = (0.09, 0.72)). The estimated SIR for each of the other acute care hospitals shows no significant difference between the observed and predicted numbers of *C. Diff* infections.

Table 3a. *Clostridium difficile* (*C. Diff*) Infections, Delaware Acute Care Hospitals, January 1 – December 31, 2018

Hospital	Patient Days	Number of Infections		SIR[b]	95% CI[a]		Interpretation of SIR[✱]
		Observed	Predicted		Lower[d]	Upper	
ALL[f]	**516,754**	**232**	**341.94**	**0.68**	**0.60**	**0.77**	★ Better
Al duPont	**46,937**	32	22.44	**1.52**	0.99	1.99	= Same
Beebe	**42,533**	22	25.53	**0.86**	0.55	1.28	= Same
Christiana	**231,311**	81	173.18	**0.47**	0.37	0.58	★ Better
Kent General	**77,671**	44	55.09	**0.80**	0.59	1.06	= Same
Milford	**21,191**	15	15.72	**0.95**	0.56	1.54	= Same
Nanticoke	**23,595**	16	12.44	**1.29**	0.76	2.04	= Same
St. Francis	**23,692**	4	13.49	**0.30**	0.09	0.72	★ Better
Wilmington	**49,824**	18	24.05	**0.75**	0.46	1.16	= Same

✱ – Legend

★	Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	=	No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X	Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.
No Conclusion	SIR is not calculated when number of predicted infections is less than 1.0.				

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 predicted 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 May 26, 2019.

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 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 generally occur in otherwise healthy people. More severe or potentially life-threatening MRSA infections, such as bloodstream infections, pneumonia and surgical site infections,

[21] Lessa FC, Mu Y, Bamberg WM, et al. Burden of *Clostridium difficile* Infection in the United States. N Engl J Med 2015; 372:825-834. http://www.nejm.org/doi/full/10.1056/NEJMoa1408913
[22] http://www.cdc.gov/HAI/organisms/cdiff/Cdiff_infect.html

occur most frequently among patients in healthcare settings. MRSA infections included in this report are only those associated with healthcare settings.

The total number of healthcare-associated cases of MRSA (HA-MRSA) infection in Delaware during 2018 was not statistically different from that predicted (SIR = 1.02) with 42 infections observed and 41.3 predicted (Table 3b). The number of MRSA infections is not statistically different than predicted at any hospital, and could not be calculated for Nanticoke Hospital.

Table 3b. Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections, Delaware Acute Care Hospitals, January 1 – December 31, 2018

Hospital	Patient Days	Number of Infections		SIR[b]	95% CI[a]		Interpretation of SIR[x]
		Observed	Predicted		Lower[d]	Upper	
ALL[f]	**546,748**	**42**	**41.29**	**1.02**	**0.74**	**1.36**	= Same
Al duPont	**53,229**	2	2.32	**0.92**	0.14	2.85	= Same
Beebe	**42,533**	2	2.03	**0.99**	0.17	3.26	= Same
Christiana	**245,552**	29	24.57	**1.18**	0.81	1.67	= Same
Kent General	**84,505**	3	6.77	**0.44**	0.11	1.21	= Same
Milford	**21,951**	0	1.06	**0.00**	---	2.84	= Same
Nanticoke	**23,595**	1	0.99	**---**	---	---	**No Conclusion**
St. Francis	**25,559**	1	1.41	**0.71**	0.04	3.51	= Same
Wilmington	**49,824**	4	2.15	**1.86**	0.59	4.48	= Same

Legend

★ Significantly fewer infections **(better)** observed than predicted, based on 2015 national baseline.	= No significant difference **(same)** between numbers of observed and predicted infections, based on 2015 national baseline.	X Significantly more infections **(worse)** observed than predicted, based on 2015 national baseline.	**No Conclusion** SIR is not calculated when number of predicted infections is less than 1.0.

e. The number of patient days is a count of the number of patients in a patient care location.
f. SIR is only calculated if the predicted number is greater than or equal to 1.
g. Confidence Limits are endpoints of the confidence interval, a range of values that accounts for random error in estimation of the SIR.
h. 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 May 26, 2019.

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 HAIs can decrease by more than 70 percent.

Notably, the infection rate of a hospital may change from year to year, which may lead to

[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.

considerable annual variation in the SIR, particularly for a small hospital. For example, if one HAI was diagnosed in a small hospital for 2018 and three diagnosed in 2018, 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 greater numbers of hospitals.

A strong collaboration between local, state and federal public health agencies and their partners in the healthcare sector is vital to sustaining and expanding progress made in HAI surveillance and prevention. CDC will continue its prevention, tracking, lab and guidance efforts 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.

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."[24]

[24] Title 16 Chapter 10A of the Delaware Code http://delcode.delaware.gov/title16/c010a/index.shtml

Appendix A

Delaware Healthcare-Associated Infections Advisory Committee

March 2019

Name	Position in Code[25]	Affiliation
Achenbach, Robin	Health Insurer	Highmark, Inc.
Abdul-Alim, Lorraine (Lori)	Quality Member	Select Specialty
Anderson, Donna	Hospital Infection Control	Stockley Center
Baker, Jo Ann	Academic Researcher	Delaware Technical Community College
Behan, Linda	Infection Control Professional	Genesis Healthcare
Cerri, Anneke	Correctional Institution	Department of Corrections
Chasanov, William	Infectious Disease Physician	Beebe Healthcare
Drees, Marci	Infectious Disease Physician	Christiana Care Health System
Duffalo, Chad	Infectious Disease Physician	Christiana Care Health System
Eppes, Stephen	Infectious Disease Physician	Christiana Care Health System
Alim, L Abdul	Quality Member	Select Specialty
Fierro, Amy	Psychiatric Facility	Delaware Psychiatric Center
Fischer, Kimberly	Hospital Infection Control	Nanticoke Memorial Hospital
Gardner, Kelly (Chair)	Hospital Infection Control	Kent General Hospital (Bayhealth)
Gee, Tia	Hospital Infection Control	Mary Campbell Center
Gilman, Margaret	Hospital Infection Control	Nemours AI duPont Hospital for Children
Helmick, Holly	Hospital Infection Control	Milford Memorial Hospital (Bayhealth)
Hong, Rick	Medical Director	Delaware Division of Public Health
Olurin, Omo	Health Maintenance Organization	Aetna, Inc.
Paxton, Helene	Hospital Infection Control	St. Francis Healthcare
Protokowicz, Nora	Hospital Infection Control	Christiana Care Health System
Reed, Robert	Purchaser of Health Care	self
Richardson, Elizabeth	Hospital Infection Control	Beebe Healthcare
Sagisi, Alfredo	Dialysis	Fresenius Medical Care
Sanders, Lisa	Organized Labor	
Snow, Jessica	Purchaser of Health Insurance	self
Tatman, Jill	Direct Care Nursing Staff	Kent General Hospital (Bayhealth)
Tomczak, Maureen	Consumer	Self
Waldron, Yrene	Health Care Facilities Assoc.	Delaware Health Care Facilities Assoc.
Walrath, Judy	HAI Specialist	Division of Public Health
Watts, Lynn	Freestanding Surgical Center	Eden Hill Medical Center
Williams, Megan	Healthcare Association	Delaware Healthcare Association
Wroten, Kathleen	Hospital Infection Control	Christiana Care Health System
vacant	Hospital Infection Control	Veterans Administration Medical Center

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

Appendix B

Hospital Comments (Not for Publication)[26]

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

[26] 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.