2015

Report on Healthcare Associated Infections (HAI) to the General Assembly

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LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

ABBREVIATION	DEFINITION
ACH	Acute care hospital
BSI	Bloodstream infection
CAUTI	Catheter-associated urinary tract infection
CDC	Centers for Disease Control and Prevention
CDI	*Clostridium difficile* infection
CHA	Connecticut Hospital Association
CLABSI	Central line-associated bloodstream infection
CMS	Centers for Medicaid and Medicare Services
COLO	NHSN code for surgical site infection following colon surgical procedures
CUSP	Comprehensive Unit-based Safety Program
DE	Dialysis event
DHHS	Department of Health and Human Services
DPH	Connecticut Department of Public Health
DU	Device utilization
FacWideIN	Facility-wide inpatient
HAI	Healthcare associated infection
HO	Hospital-onset
HYST	NHSN code for surgical site infection following abdominal hysterectomies
ICU	Intensive care unit
IP	Infection Preventionist
IPPS	Inpatient Prospective Payment System
IRF	Inpatient rehabilitation facility
LTACH	Long-term acute care hospital
MRSA	Methicillin-resistant *Staphylococcus aureus*
NHSN	National Healthcare Safety Network
NICU	Neonatal intensive care unit
PICU	Pediatric intensive care unit
QI	Quality improvement
QIP	Quality Incentive Program
SIR	Standardized infection ratio
SSI	Surgical site infection

EXECUTIVE SUMMARY

This is the seventh annual report on Healthcare Associated Infections (HAI) to the Connecticut General Assembly, pursuant to C.G.S. 19a-490o. It is an update on which HAI are reportable, with data on trends and progress on reducing HAI in Connecticut healthcare facilities. The Connecticut Department of Public Health (DPH) HAI website provides additional reports, data, and educational materials at http://www.ct.gov/dph/cwp/view.asp?a=3136&q=417318.

From 2008 to 2011, Connecticut acute care hospitals (ACH) were mandated to report central line-associated blood stream infections (CLABSI) from one adult intensive care unit (ICU) per hospital and all pediatric ICUs (PICUs), via the Centers for Disease Control and Prevention's (CDC) secure online data collection system, the National Healthcare Safety Network (NHSN). In 2011, the Connecticut HAI Advisory Committee ("the HAI Advisory Committee") recommended that the state HAI reporting mirror federal Centers for Medicaid and Medicare Services (CMS) health facility quality improvement (QI) reporting, which expanded HAI surveillance considerably to include additional ICU for CLABSI reporting as well as two new types of HAI: catheter-associated urinary tract infections (CAUTI) in all ACH adult and PICU locations, and surgical site infections (SSI) following colon surgical procedures and abdominal hysterectomies. In 2012, CMS, and concurrently Connecticut, further broadened its requirements for the reporting of HAI data via NHSN beyond ACH for the first time. This change required long-term acute care hospitals (LTACH) to report CLABSI and CAUTI in adult and pediatric ICU and wards, and inpatient rehabilitation facilities (IRF) to report CAUTI in adult and pediatric ward locations. Reporting of methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and *Clostridium difficile* infection (CDI) based on hospital microbiology laboratory results were also added to requirements for ACH, LTACH, and IRF. Beginning in 2015, outpatient hemodialysis centers are also being included in Connecticut state reporting. NHSN has a special surveillance module customized for hemodialysis facilities. It measures dialysis events (DE), which include blood stream infections (BSI), infections of the access site, and antimicrobial starts.

Connecticut, other states, and the CDC use a statistical measure called the standardized infection ratio (SIR) to assess the burden of HAI and to track progress in prevention in all healthcare settings except for outpatient hemodialysis centers. The SIR can be used to compare the number of HAI in a healthcare facility, a location within the facility, or the facilities statewide to the number of infections predicted based on national HAI data across the United States. A statistically significant SIR measuring below 1.0 means the state, facility, or location is performing better than predicted based on national data; a statistically significant SIR above 1.0 means the state, facility, or location is performing worse than predicted. For dialysis centers, rates rather than SIRs are used. A rate is a proportion, the number of events divided by the size of population at risk. Similarly to SIRs over 1.0, rates of infections or dialysis events, which are higher than the national rates, indicate the need for assessment and enhanced prevention actions. In the data presented in this report, the SIR of 1.0 is considered the baseline for all outcomes measured by SIR.

The federal Department of Health and Human Services (DHHS) created a national HAI prevention plan that specifies national HAI prevention targets for key HAI in various healthcare settings. For the first period of national HAI surveillance, ending with 2013, the target for CLABSI in ACH was an SIR of 0.5 representing a 50% reduction from the 2006-2008 baseline period. For both CAUTI and SSI in ACH, the National Prevention Target by the end of the extended target period of 2014 was a 25% reduction in CAUTI (equivalent to an SIR of 0.75). The National Prevention Target for laboratory-identified (LabID) MRSA bacteremia was a 25% reduction in MRSA bacteremia (equivalent to a 0.75 SIR), and the 2013

National Prevention Target for LabID *Clostridium difficile* infection (CDI) was a 30% reduction in CDI (equivalent to an SIR of 0.70). There are no national prevention targets for LTACH and IRF at this time; however, this is expected to change when new national baselines are published. 2015 will be the new baseline year and the new baselines will be published early in 2017. The National Prevention Targets were extremely ambitious and were not achieved nationally. Except for CLABSI in ICUs, the National Prevention Targets were not achieved in Connecticut. DHHS will be developing new HAI prevention targets. We do not have information yet on when the new national prevention targets will be coming out.

Acute Care Hospital Data (page 10)

- Patient HAI surveillance and prevention requires the presence of dedicated, trained Infection Prevention (IP) staff in healthcare facilites, sufficient IP time is critical. In 2015, the average number of full time (40 hour/week) IPs per ACH was slightly over 2, and the average number of staffed beds per full time IP was 112.9. Several ACH in Connecticut have ratios much higher than average, and non-teaching and very small ACH have a better IP to bed ratio than larger and teaching hospitals. Because the responsibilities of IPs continue to increase, increasing the number of IPs to lower the IP:bed ratio and to hire other staff for related roles (e.g., clerical, data entry) should be considered, as resources permit.
- Connecticut has had success in reducing CLABSI. From 2009 to 2014, the SIR in ACH ICUs serving adults decreased from 0.91 to 0.42, with an increase to 0.56 in 2015; in pediatric ICUs, the statewide in 2015 was 1.19; and in neonatal ICUs the statewide CLABSI SIR was 0.60 in 2015. CLABSI data from wards are reported here for the first time, and in general, the SIR for non-ICU ward locations is higher than for ICU locations. In ACH adult wards, the overall state CLABSI SIR was 0.84, and in pediatric wards it was 0.77.
- The interpretation of CAUTI data is complicated by a 2015 change to the NHSN surveillance definition. The statewide CAUTI SIR in adult ICU locations was 0.62, significantly less than the 2014 SIR of 1.68; the statewide CAUTI SIR in pediatric ICU locations was 1.14 compared to the 2014 SIR of 1.67. The CAUTI SIR for adult ward locations was 0.60, and the CAUTI SIR for pediatric ward locations was 0.58.
- SSI SIRs have been higher than the national baseline, and did not attain the HAI prevention plan benchmarks. Connecticut's ACH SSI SIR following colon surgical procedures was 1.24. The SIR following abdominal hysterectomies decreased from 1.45 in 2012 to 1.12 in 2015.
- Connecticut ACH have done well in reducing LabID MRSA bacteremia; from 2013 to 2014, the MRSA SIR decreased from 0.74 to 0.65, though the Connecticut ACH MRSA bacteremia SIR was somewhat higher in 2015(0.82) compared to 2014 (0.65), it was still well below the baseline SIR of 1.0.
- Connecticut ACH have had LabID CDI somewhat higher than the baseline but not statistically different from it. In 2015, Connecticut ACH CDI SIR was 1.01.

Long-Term Acute Care Hospital Data (page 16)

- Connecticut LTACH achieved a good and statistically significant CLABSI SIR of 0.38. The SIR of 0.54 for critical care locations was not statistically significant, while the SIR of 0.25 for LTACH wards was statistically significant.
- Connecticut LTACH observed CAUTI SIR of 1.50 which was not statistically significant. The SIR of 1.51 for critical care locations was not statistically significantly different from the national

baseline of 1.0, nor was the SIR of 1.49 for LTACH wards. Therefore, we cannot say it is lower (or higher) than baseline.

- The rate of MRSA bacteremia in Connecticut LTACH was 0.06 per 1,000 patient days. For CDI, the rate was 2.19 per 10,000 patient days. National rates were not available for comparison.

Inpatient Rehabilitation Facility Data (page 18)

- Connecticut IRF observed a CAUTI SIR of 0.93, however this was not statistically significant, which means we cannot say it is different from baseline.

Outpatient Hemodialysis Center Data (page 19)

- This is the first year of public reporting of dialysis centers in Connecticut.
- The rate of bloodstream infections in dialysis patients in Connecticut closely matches the rates nationally. The rate of access-site-related blood stream infections in CT was 0.40 per 10,000 patient-months vs. 0.40 nationally. For blood stream infections, the rate in CT was 0.67 per 10,000 patient-months vs. 0.64 nationally. Neither of these differences were statistically significant.
- The rates of infections at the access site were higher in Connecticut dialysis centers than nationally. The rate of vascular access infections was 1.41 per 10,000 patient-months in Connecticut vs. 1.21 nationally.
- The rate of intravenous antimicrobial (usually antibiotic) starts were also higher in Connecticut than nationally. In Connecticut, this rate was 3.78 per 10,000 patient-months vs. 3.27 nationally.
- These data suggest that the care of dialysis patient access sites may need to be enhanced to prevent infections.

2015 HAI Reporting, Connecticut (Standardized Infection Ratios)

Facility Type	Location	Patients	CLABSI	CAUTI	SSI (COLO/HYST)	MRSA	C. diff
ACH	ICU	Adult	0.56	0.62	1.24/1.12	0.82	1.01
ACH	ICU	Pedi	1.19	1.14			
ACH	ICU	NICU	0.60				
ACH	Ward	Adult	0.84	0.60			
ACH	Ward	Pedi	0.77	0.58			
LTACH	ICU		0.38	1.51		0.06*	2.19*
LTACH	Ward		0.25	1.49			
IRF				0.93			

*Rate per 10,000 patient days

Not applicable

Data for Action

Although Connecticut has seen some success in reducing HAI, we need to make further progress in the prevention of these infections. The reduction in CLABSI has been a bright spot, but expansion of our surveillance from ICUs towards this year shows a significant number of infections in patients with central

line catheters in non-ICU ward locations, we need to improve prevention activity specifically for this setting. Over the past few years we have not seen significant progress in reducing CAUTI. This year's change to the NHSN CAUTI case definition resulted in a major decrease in the CAUTI SIR for Connecticut's ACH, which raises the question of whether the excess CAUTI in Connecticut in past years were of particular concern and preventable, or were more likely due to problems with the specificity of the prior case definition. We will continue to monitor CAUTI identified using this more focused case definition and develop plans to build on this and further decrease CAUTI. We have not done well in reducing SSI following the two types of procedures that we track: colon surgical procedures and abdominal hysterectomies. However, these two types of SSI may not be the best measures to track and act on, there are other SSIs, such as hip and knee replacements that may be more reliable to track and equally important to prevent. State HAI programs and the CDC are discussing this issue. Despite progress made in reducing MRSA bacteremia, we need to focus efforts to reduce rates of *C. difficile*, a serious infection that can be prevented through careful hand hygiene, thorough environmental cleaning, and antibiotic stewardship.

PARTNERSHIPS AND HAI PREVENTION IN HEALTHCARE FACILITIES

DPH and the medical community partner to perform HAI surveillance. Staff in the facilities gather the data and enter it into NHSN. DPH epidemiologists review the data for completeness and accuracy, and prepare surveillance reports. NHSN also permits healthcare providers in the facilities to access their own data and assess data quality and identify problem areas. DPH sponsors and participates in training and technical assistance meetings with staff from healthcare facilities on the use of NHSN and on HAI surveillance methods and improvement.

Connecticut DPH both convenes and participates in advisory groups consisting of consumers, healthcare providers, facility representatives, infection prevention staff, and healthcare and patient safety organizations. DPH has also either hosted or participated in a number of public information campaigns, conferences and seminars on infection prevention and approaches for promoting quality improvement for infection prevention.

These data are used by prevention collaboratives (groups of health facilities sharing best practices for prevention) in the state led by patient safety organizations partnering with DPH, such as the Connecticut Hospital Association (CHA), Qualidigm, and the End Stage Renal Disease (ESRD) Network of New England. HAI surveillance data show that Connecticut DPH, our partners, and the medical community need to continue efforts to prevent HAI in Connecticut, and to concentrate resources on specific high priority areas for higher-impact outcomes.

CDC funded DPH for a three-year "Infection Control Assessment and Response" (ICAR) initiative to offer onsite technical assistance to healthcare facilities, including ACH, LTACHs, LTCFs, and outpatient hemodialysis centers. CDC is also supporting the building of capacity at the Katherine Kelley State Laboratory to permit testing for Carbapenem-resistant Enterobacteriaceae (CRE) and other serious antibiotic resistant bacteria and to participate in a national network to investigate outbreaks of highly resistant "superbugs."

FUTURE STEPS

Expansion of HAI reporting in Connecticut

Connecticut DPH aligns state HAI reporting with the Centers for Medicaid and Medicare Services (CMS) healthcare facility quality payment incentive programs. These CMS measures in turn align with the advice of experts in the field and scientific and policy organizations. There has been considerable expansion of reporting in the past four years to include new HAI measures as well as additional healthcare facility types across the continuum of care. No changes are anticipated to current Connecticut reporting requirements in the near future.

Rebaselining

The SIR baselines currently used for tracking HAIs were developed several years before NHSN became widely used nationwide. The baselines were developed for different HAIs during different baseline time periods, and the case definitions of HAIs have been modified over time as we learn more about them. We need to develop and implement new baselines, in a process known as "rebaselining." The new baselines for HAIs were developed in 2015, and will be used for our reports starting with 2016 data. We will continue to track our progress, now with more updated information.

ANNUAL HAI PROGRESS REPORT

HOW HEALTHCARE ASSOCIATED INFECTIONS MEASURES ARE MADE MANDATORILY REPORTABLE

In 2006, the Connecticut General Assembly established the HAI Advisory Committee and directed Connecticut DPH to develop a state public health HAI program to raise awareness of HAI, promote transparency for healthcare consumers, and promote the collection, analysis, and sharing of data to foster and guide infection prevention action in healthcare settings. Tracking, measuring, and reporting of HAI data are important to understand statewide trends, identify patterns of infection, and ensure readiness for the possible emergence of new or unusual microorganisms.

The HAI Advisory Committee meets quarterly to provide recommendations to Connecticut DPH on HAI public reporting and public awareness. It consists of 11 voting members and approximately 40 regular non-member participants. Among these committed individuals are hospital epidemiologists, infection preventionists (IP), healthcare consumers and advocates, quality improvement and patient safety professionals, and professional healthcare associations. Non-voting participants attend meetings and participate in discussion, but do not have the authority to vote on formal motions set before the HAI Advisory Committee. All substantive business, such as recommendations to Connecticut DPH regarding which HAI should be publicly reported, must be conducted through formal motion and majority vote by the voting members. These deliberations are informed by the most current science of HAI surveillance and prevention in the medical and public health literature, sharing of best practices among states and the CDC, and the practical experience and perspective of the members of the HAI Advisory Committee.

Once the HAI Advisory Committee makes a recommendation regarding selection and surveillance methods for new HAI measures, in accordance with Connecticut General Statutes Section 19a-490o, their recommendation is considered by the Connecticut DPH Reportable Diseases Advisory Committee ("the Reportable Diseases Advisory Committee") for inclusion in a Connecticut DPH list published annually in the *Connecticut Epidemiologist* Newsletter, "Reportable Diseases, Emergency Illnesses and Health Conditions." This list is revised and published each year in compliance with C.G.S. 19a-2a and Section 19a-36-A2 of the Public Health Code. When the recommendation is accepted by the Connecticut DPH Commissioner (as it has each time a recommendation to include a particular HAI measure has been made), it is then placed on the annual reportable conditions list with reporting instructions.

The 2015 members of the HAI Advisory Committee were:

- Department of Public Health Commissioner or Commissioner's designee
  Wendy Furniss, Chief, Healthcare Safety & Quality Branch, Connecticut DPH, Hartford, CT
- Two representatives from the Connecticut Hospital Association
  Alison Hong, MD, Director, Quality and Patient Safety, CT Hospital Association, Wallingford, CT
  Carl Schiessel, CT Hospital Association, Wallingford, CT
- Two representatives from organizations representing health care consumers
  Valerie Wyzykowski, Office of Healthcare Advocate, State of CT, Hartford, CT
  Jean Rexford, Executive Director, Connecticut Center for Patient Safety, Hartford, CT
- Two representatives who are hospital-based infectious disease specialists or epidemiologists
  Louise Dembry, MD, Hospital Epidemiologist, Yale-New Haven Hospital, New Haven, CT
  Brenda Grant, RN, MPH, CIC, Infection Preventionist, Stamford Hospital, Stamford, CT
- One representative from the Connecticut State Medical Society
  Jack Ross, MD, Chief, Infectious Diseases & Epidemiology, Hartford Hospital, Hartford, CT

- One representative from a labor organization representing hospital-based nurses
  Dale Cunningham, American Federation of Teachers, Rocky Hill, CT
- Two members from the public
  Raymond Andrews, Trustee, The Donaghue Medical Research Foundation, West Hartford, CT
  Lynne Garner, PhD, President and Trustee, The Donaghue Medical Research Foundation, West Hartford, CT

HEALTHCARE ASSOCIATED INFECTIONS SUBJECT TO REPORTING IN CONNECTICUT

After a yearlong period of planning, which culminated in the establishment of Connecticut DPH HAI Program, and the hiring of HAI Program staff, reporting of HAI data from ACH to Connecticut DPH began in 2008. The HAI Advisory Committee recommended that reporting from ACH would initially be required only for CLABSI in adult and pediatric ICU.

Beginning in 2011, CMS expanded "pay for reporting" HAI reporting requirements for the Inpatient Prospective Payment System (IPPS) for ACH and the Quality Incentive Program (QIP) for hemodialysis centers as a condition of receiving annual supplemental payments. CMS continues to require that these data be reported using NHSN. Additionally, this expansion aimed to add new classes of facilities beyond ACH, new locations within hospitals, and new types of HAI to the reporting expectations; CMS reporting requirements are expected to continue to expand in the foreseeable future.

That same year, the HAI Advisory Committee recommended that the Connecticut HAI reporting mandate mirror the CMS reporting mandate. This resulted in an expansion in the HAI surveillance measures that were to be reported by ACH to Connecticut DPH and subsequently to the public. Beginning in 2012, all types of ICU, including NICU, in ACH were added to the list of locations required to report CLABSI and CAUTI HAI data. In 2012, reporting expanded to include CAUTI and SSI following colon surgical procedures and abdominal hysterectomies. As of January 2013, two new HAI measures in ACH were made reportable to Connecticut DPH: MRSA bacteremia and CDI LabID events. LabID events report patient-specific data on these two infections generated from hospital microbiology laboratory results, and are reported for all inpatients, facility-wide (FacWideIN), except inpatient neonatal intensive care unit (NICU) data for CDI. HAI reporting requirements were also added mandating IRF to report CAUTI in all bedded inpatient locations as well as MRSA bacteremia and CDI LabID events, and mandating LTACH to report both CAUTI and CLABSI in all bedded inpatient care locations as well as MRSA bacteremia and CDI LabID events. In 2015, ACH ward CLABSI and CAUTI data and outpatient hemodialysis centers dialysis event data were added to the reporting.

HOW HEALTHCARE ASSOCIATED INFECTIONS DATA ARE COLLECTED

The HAI reporting mandate requires healthcare facilities to report specific HAI-related data to NHSN, which is a secure, internet-based surveillance system that healthcare facilities may use to track and report HAI data. NHSN includes standardized definitions, built-in analytical tools, user training and support, and integrated data quality checks. Only persons who have completed training on the standard definitions and surveillance methodology may perform NHSN data entry, and all protocols must be followed precisely. These protocols provide a rigorous national and state standard to ensure consistent collection of comparable data. The CDC makes NHSN available to all United States healthcare facilities across the spectrum of healthcare at no cost, and, as of the writing of this report, is currently collecting data from nearly 19,000 facilities from all fifty states, the District of Columbia, and the Commonwealth of Puerto Rico.

Participation in NHSN requires a considerable commitment by each participating healthcare facility. Qualified IPs, or other staff trained in infection prevention, trained in nursing, microbiology, epidemiology, and/or medical technology, conduct HAI surveillance, and all have obtained additional education in infection prevention and control. These individuals collect HAI data from a variety of sources maintained by facilities, such as laboratory culture results, patient medical records, and flowcharts, such as those maintained on ICU patients. When facility IP determines that a patient has a condition that meets the NHSN definition of an HAI, then the infection is reported to Connecticut DPH via NHSN. The data are stored on the secure NHSN server which is protected from inappropriate disclosure by both software security features and federal law. Once entered, the data are immediately available to the facility for viewing, analysis, and updating. Facility NHSN users must confer rights to the DPH HAI Program, which allows it to view and analyze the data for public reporting. All patient and facility information is protected by state and federal law and are stored on secure computers.

The Connecticut DPH and CDC NHSN staffs ensure correct use of NHSN by Connecticut healthcare facilities as well as foster data accuracy by providing training to healthcare facility staff regarding how to apply the surveillance protocols that define an NHSN-reportable HAI, as well as how to collect, enter, and analyze the data. The data in this report reflect all data for the calendar year of 2015 entered in NHSN by Connecticut ACH, LTACH, IRF, and hemodialysis centers on November 8, 2016.

NHSN differentiates between three major categories of HAI: device-associated, procedure-associated, and laboratory-identified. In this report, the device-associated HAI are CAUTI and CLABSI; procedure-associated HAI are infections associated with colon surgery or abdominal hysterectomy; and laboratory-identified HAI are CDI and MRSA bacteremia.

HEALTHCARE ASSOCIATED INFECTIONS DATA CLEANING AND VALIDATION

Data must be validated to ensure timeliness, completeness, accuracy, and compliance with NHSN reporting protocols. The DPH HAI Program works to ensure that Connecticut facilities are interpreting and applying these definitions consistently by applying its own data validation process to review the data for completeness and accuracy. There are several points at which the data are checked for validity. NHSN has a series of internal logic checks that prevent users from entering inaccurate data. Further data checks are conducted by the DPH HAI Program using output from NHSN itself aimed at identifying data quality issues. DPH HAI Program staff also periodically contact facility reporting partners to review their facilities' data, and to ask facility users to resolve data quality "alerts." Finally, as resources permit, DPH HAI Program epidemiologists visit ACH in the state to perform data validation studies, which include audits of patient medical records. These chart reviews are intended to identify patient outcomes that have been misclassified. Inconsistencies are discussed with the facility and addressed accordingly within NHSN to ensure adherence to the reporting guidelines. On average, this process occurs every two to three years for an HAI. In total, this approach to data cleaning and validation acts as a broad safety net to ensure that publicly-reported facility HAI data are accurate.

INTERPRETING HEALTHCARE ASSOCIATED INFECTIONS DATA

The Standardized Infection Ratio

The SIR is a statistical measure used to track HAIs at a national, state, facility level, or facility location (e.g., an ICU or ward). The SIR adjusts for the fact that each healthcare facility treats different

populations of patients. For example, the experience with HAI at a facility with a large burn unit (a location where patients are increased risk of acquiring infections due to the nature of their illness compared to other patients) cannot be directly compared to a facility without a burn unit. The SIR is calculated by dividing the number of observed infections by the number of predicted infections.

$$\textbf{Standardized infection ratio (SIR)} = \frac{\textbf{Observed number of infections}}{\textbf{Predicted number of infections}}$$

The predicted number of infections is an estimation of HAI based on national NHSN HAI baseline data, and is adjusted for risk factors associated with differences in infection rates. The periods during which baseline data (also called referent periods) for each infection type have been collected for this report are:

HAI Measure	Facility Type	Referent Period
CLABSI	ACH	January 2006 – December 2008
CLABSI	LTACH	January 2013 – December 2013
CAUTI	ACH	January 2009 – December 2009
CAUTI	LTACH	January 2013 – December 2013
SSI	All	January 2006 – December 2008
MRSA bacteremia	All	January 2010 – December 2011
C. difficile infection	All	January 2010 – December 2011

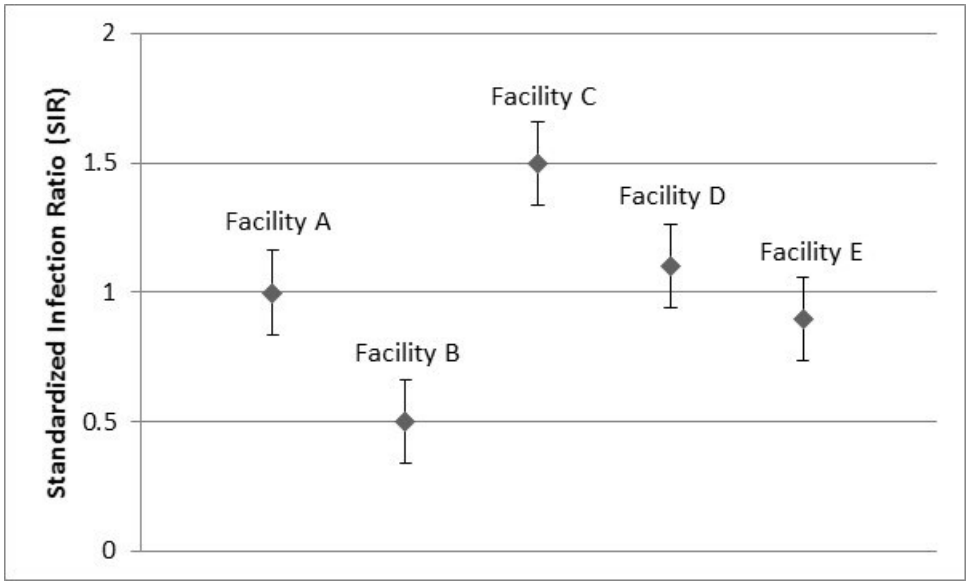
How to Interpret the Standardized Infection Ratio

- If the **SIR is equal to 1.0**, then the number of observed infections is the same as the number of predicted infections.
- If the **SIR is less than 1.0**, then there were fewer infections observed than predicted.
- If the **SIR is greater than 1.0**, then there were more infections observed than predicted.

Any test result, including the SIR, could be influenced by chance. Statistical tests are used to determine whether the difference between the number of observed infections and the number of predicted infections could be due to chance, and not necessarily a real finding. If it is extremely unlikely that a difference is due to chance and is therefore likely real, then the difference is considered "statistically significant." One measure of statistical significance is the 95% confidence interval, a range falling around the SIR calculated by NHSN for that HAI for that state, healthcare facility or facility location. There is no more than 1 in 20 chances (5%) that the SIR lies outside the 95% confidence interval range. An SIR with a confidence interval that does not include the baseline value of 1.0 is considered statistically significant, while an SIR with a confidence interval includes 1.0 within its range is not considered statistically significant. Even if the SIR is less than or greater than 1.0, if it is not statistically significant, the number of observed infections is considered similar to the number of predicted infections. The width of the 95% confidence interval range depends on the size of the population at risk being reported on. If there are many patients, the size of the confidence interval range will be narrow, but if there are few patients the range will be wide. Wide ranges make it more likely the baseline value of 1.0 will be within the range, even if the SIR is far away from 1.0, and then we cannot say whether the difference between the SIR and the baseline value of 1.0 is real or just due to chance.

We want SIRs to be accurately counted. We also would like to see SIRs less than 1.0, decreasing, and statistically significant.

The example below shows SIR for three healthcare facilities along with their 95% confidence intervals.



Facilities A, D, and E: If the 95% confidence interval crosses the baseline (reference line) of 1.0, the SIR is not statistically significant, and we can conclude that the facility has observed a similar number of infections to what was predicted. This is true regardless of whether the SIR falls above or below the reference line of 1.0.

Facility B: If the upper bound of the 95% confidence interval falls below the reference line of 1.0, the SIR is statistically significant, and we can conclude that the facility has observed fewer infections than were predicted.

Facility C: If the lower bound of the 95% confidence interval falls above the reference line of 1.0, the SIR is statistically significant, and we can conclude that the facility has observed more infections than were predicted.

Event Rates

To evaluate HAI events at outpatient hemodialysis centers, rates are used, rather than the SIR. The measure reflects how many events (e.g. blood stream infections, access site infections, antibiotic starts) were observed in patient population while accounting for the number of patients and the duration of their exposure to risk factors for infection, also known as person-time. In this report, for hemodialysis centers we use person-months (i.e. each month a patient was receiving care at a hemodialysis facility). The rate is calculated by dividing the number of observed infections by 100 person-months.

$$\textbf{Rate} = \frac{\textbf{Number of observed infections}}{\textbf{Total number of person-months} \times \textbf{100}}$$

HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE RESULTS: ACUTE CARE HOSPITALS

ACH enrolled in NHSN are required to complete an annual survey about the facility's infrastructure to gather data needed for NHSN to calculate risk adjustments for SIRs for that facility. Thirty-two Connecticut ACH reported HAI data into NHSN in 2015.[1] The ACH's size and IP staffing are also ascertained. In 2015, the average number of full time (40 hour/week) IPs per ACH in Connecticut was slightly over 2, and the average number of beds per ACH was approximately 237; the average number of staffed beds per full time IP was 112.9. Patient admissions over the year averaged 13,542 per ACH, and average patient days was 59,863. Of the 32 hospitals, 16 categorized themselves as major teaching hospitals, which train medical students and post-graduate residents but not fellows (Table 1). Two categorized themselves as graduate teaching hospitals, which train post-graduate residents and fellows but not medical students, and one categorized itself as an undergraduate teaching hospital, which trains only undergraduate medical students.

Table 1: 2015 Connecticut reporting acute care hospitals by teaching type

Teaching Type	# (%)
Graduate Teaching	2 (6.3)
Major Teaching	16 (50.0)
Non-teaching	13 (40.6)
Undergraduate Teaching	1 (3.1)
Total	32 (100)

Figure 1: Number of acute care hospitals by number of staffed beds per one full time (40 hr/wk) infection preventionist and by teaching status

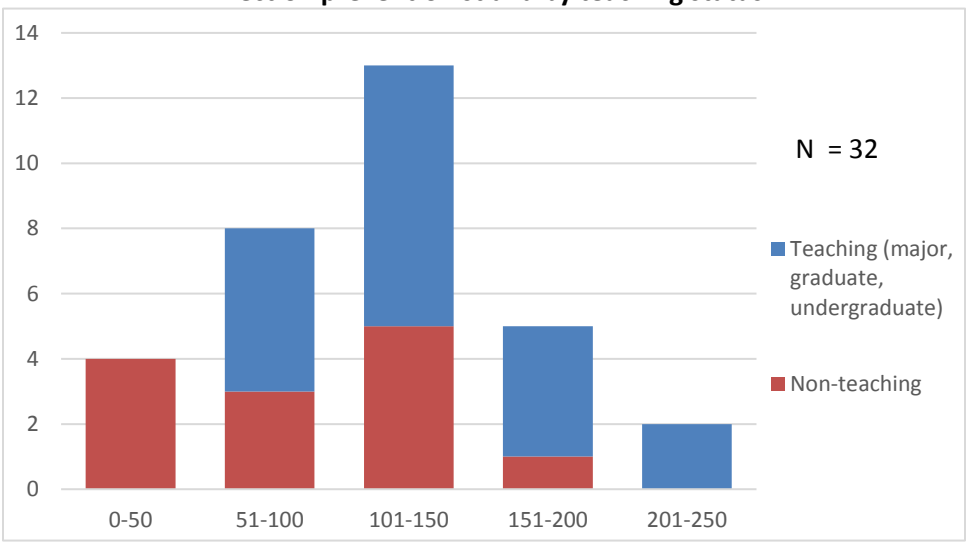
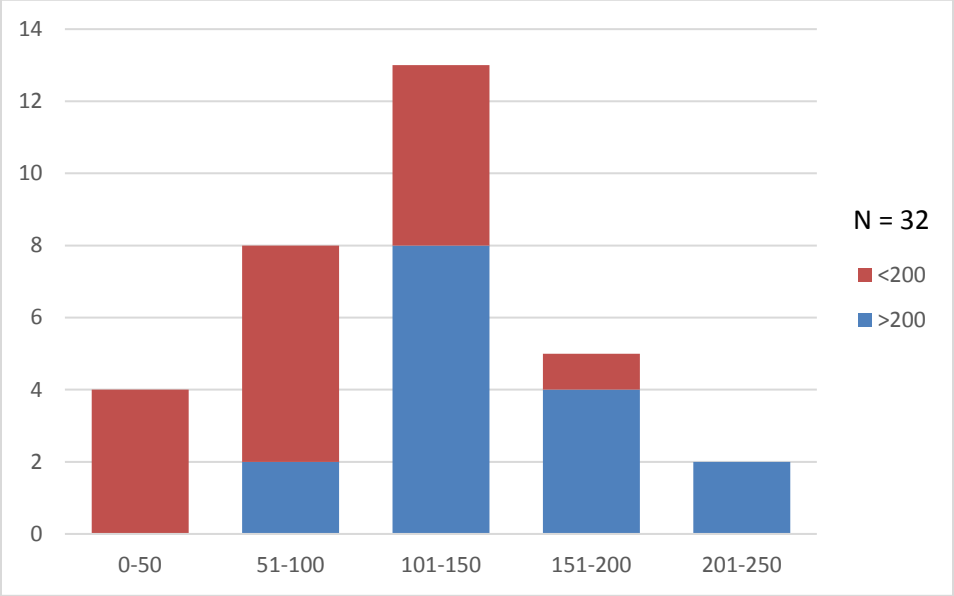


Figure 2: Number of acute care hospitals by number of staffed beds per one full time (40 hr/wk)

[1] For the purposes of HAI surveillance, Yale-New Haven Hospital and Yale-New Haven Saint Raphael's campuses are reported as separate facilities.

infection preventionist and by hospital size



HAI surveillance and prevention requires the presence of dedicated trained IP staff in healthcare facilities. These staff have many duties, and therefore sufficient IP time is critical infrastructure to prevent HAIs. A 2009 study published in the *American Journal of Infection Control* by Columbia University, RAND Corporation, and CDC found that the average ratio of full-time IPs to staffed patient beds was one IP to 144 beds. The two graphs above indicate that several ACH in Connecticut have higher ratios, and contrary to expectations, non-teaching and very small ACH have a an IP to bed ratio better than larger and teaching hospitals. The Columbia-RAND-CDC study also found that larger hospitals had less favorable IP to bed ratios than smaller hospitals. Because the responsibilities of IPs continue to increase, increasing the number of IPs to lower the IP:bed ratio and to hire other staff for related roles (e.g., clerical, data entry), should be considered, as resources permit.

Central Line-Associated Bloodstream Infections, Intensive Care Units

A central line is a flexible tube that is placed through the skin into a large vein in a patient's chest, arm, neck, or groin and ends in or close to the heart or one of the major blood vessels near the heart. Central lines are tubes used to administer fluids, nutrition, chemotherapy, antibiotics, blood and blood products, monitor the cardiovascular system, or to draw blood when repeated draws are needed. While they are an essential part of providing medical care for many patients, and are beneficial and often lifesaving, their use also may place patients at risk for infection because the line can serve as a way for bacteria to cross the barrier posed by intact skin and into the blood, particularly when they are not inserted correctly or kept scrupulously clean. These infections hurt patients, are serious, costly, and most can be prevented by following accepted practices for inserting and caring for central lines.

ICUs are critical care units in hospitals where the sickest patients are cared for with increased healthcare provider staffing, capacity for monitoring, and physical support of the patient. The latter includes respiratory ventilators, cardiac monitors, etc. Patients in ICUs are often immediately post-surgical, post-trauma, or with life-threatening medical conditions.

Table 2 categorizes ICUs by the age of the patients to account for differences by age in the types of medical and surgical conditions, care needs of the patients, and risk of infection.

Table 2: 2015 CLABSI SIR, all Connecticut acute care hospital ICU

	Observed # CLABSI	Predicted # CLABSI	# Central Line Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
Adult ICU	88	157.1	77,079	0.56	0.45, 0.69	★
Pediatric ICU	13	10.97	3,657	1.19	0.66, 1.98	=
Neonatal ICU*	16	26.75	11,191	0.60	0.35, 0.95	★

** Includes Neonatal ICU level II/III and III*

Connecticut has had a general decrease in CLABSI in ICUs in ACH since 2009, from an SIR of 0.91 in 2009 to an SIR of 0.42 in 2014. A small rise in the CLABSI SIR was observed during 2012, however it is believed that this may have been in part due to a change in reporting law mandating HAI surveillance in Connecticut to reflect CMS reporting (from only one ICU in each ACH reporting CLABSI to all ICU reporting the measure starting in 2012).

In 2015, Connecticut ACH adult ICUs reported 88 CLABSI, approximately 44% less than predicted. This resulted in a statistically signficant SIR of 0.56 (Table 2). This is an increase from 2014, and may be due to some changes made in the NHSN CLABSI case definition, which may affect CLABSI SIRs from adult, pediatric, and neonatal ICUs. Because sustaining quality care is a well-known challenge, it will be important to continue to monitor this trend to ensure that if continues, it be assessed and addressed.

There are two PICU in Connecticut ACH. During 2015, PICU reported 13 CLABSI, approximately 19% more than predicted. This resulted in an SIR of 1.19 (Table 2). While this SIR is not statistically significant, it is a large increase from the 2014 SIR of 0.48. Between 2009 and 2014, the CLABSI SIR in PICU decreased, from 0.89 to 0.48. None of these SIRs are statistically significant. The lack of statisical significance is unsurprising considering the small numbers of patients cared for in this setting; the small numbers result in wide confidence intervals, making assessment of statistical signficance difficult to attain However, as for adults, the higher SIR in 2015 compared to 2014 bears watching, and intervention as needed.

Connecticut ACH began reporting CLABSI data from the 12 NICUs in 2012. During 2015, 16 CLABSI occurring in NICU were observed, approximately 40% fewer than predicted. This resulted in a statistically significant SIR of 0.60, indicating that fewer CLABSI occurred in Connecticut's NICUs than predicted. There was an increase from the 2014 SIR of 0.35; however, the increase was not statistically significant due to the small numbers of neonates at risk. Overall, CLABSI SIR has been decreasing in Connecticut's NICUs since 2009, demonstrating the effectiveness of the efforts of our neonatal care community in reducing these serious infections in this vulnerable patient population.

As noted before, changes were made in the CLABSI definition in 2015, which may or may not explain the increase in SIRs in ICUs. The increase in all types of ICUs is suggestive, but does not prove, that the CLABSI surveillance definition, rather than infection prevention practices at the bedside, may have a role in those increases.

Central Line-Associated Bloodstream Infections, Wards

A ward is an inpatient floor location of an ACH where patients receive non-intensive but skilled-level nursing and medical care. The wards are often stratified by patient age and type of medical care provided (e.g. medical, surgical, medical-surgical, oncology, gynecology, etc.). While central lines are often used in ICUs, they are also increasingly used in patients on the wards who receive longer-term medication, such as long-term antibiotics or chemotherapy.

Table 3: 2015 CLABSI SIR, all Connecticut acute care hospital wards

	Observed # CLABSI	Predicted # CLABSI	# Central Line Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
Adult	135	161.48	112,835	0.84	0.70, 0.99	★
Pediatric	9	11.67	4,079	0.77	0.38, 1.42	=

During 2015, 135 CLABSI occurred in Connecticut's ACH adult wards, approximately 16% less than predicted, resulting in a statistically significant SIR of 0.84. In pediatric wards, 9 CLABSI were observed during the same period, approximately 23% less than predicted. This resulted in an SIR of 0.77, which was not statistically significant (Table 3). To assess trends by ward, several more years of data will need to be collected.

Catheter-Associated Urinary Tract Infections, Intensive Care Units

Urinary tract infections are a common type of HAI in ACH. CAUTI may occur when indwelling urinary catheters (usually called a Foley catheter) are contaminated while being placed, left in too long, or not maintained correctly; pathogens may travel through the catheter to infect the bladder and even the kidneys. CAUTI have been associated with increased illness, death, cost, and longer stays in the hospital. While these devices are often very important for medical monitoring of the patient's health status as well as patient comfort and hygiene, sometimes catheters are not necessary, and removal of such catheters can prevent this HAI.

Table 4: 2015 CAUTI SIR, all Connecticut acute care hospital ICU

	Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
Adult ICU	132	213.78	96,040	0.62	0.52, 0.73	★
Pediatric ICU	4	3.51	1,255	1.14	0.36, 2.75	=

During 2015, Connecticut ACH ICUs reported 136 CAUTI. Of these, 132 occurred in adult ICUs, approximately 38% less than was predicted. This resulted in a statistically significant SIR of 0.62, indicating that fewer CAUTI were observed than were predicted. Pediatric ICUs accounted for the remaining 4 CAUTI, 14 % more than predicted, resulting in an SIR of 1.14 that was not statistically significant. This indicates that approximately the same number CAUTI were observed in pediatric ICUs than predicted (Table 4).

The dramatic drop in the ICU CAUTI SIR from 1.68 in 2014 to 0.62 in adults and 1.14 in pediatric patients in 2015 is due to a major revision in the case definition of CAUTI. Fungal infections and patients with lower bacterial colony counts and abnormal urinalysis were removed. This ensures that the newly defined CAUTI are more clearly related to a true infection and more in need of prevention.

Catheter-Associated Urinary Tract Infections, Wards

While urinary catheters are frequently used in ICUs, they are also frequently used in patients on wards who need careful monitoring of their urinary output, or who have urinary incontinence or obstruction.

Table 5: 2015 CAUTI SIR, all Connecticut acute care hospital wards

	Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
Adult	118	196.75	108,614	0.60	0.50, 0.716	★
Pediatric	1	1.74	639	0.58	0.03, 2.83	=

During 2015, Connecticut ACH wards reported 119 CAUTI. One hundred-eighteen of these occurred in adult ICUs, 40% less than was predicted. This resulted in a statistically significant SIR of 0.60, indicating that fewer CAUTI occurred than were predicted. Pediatric ICUs accounted for the remaining one CAUTI, 42 % less than predicted, resulting in an SIR of 0.58 that was not statistically significant. This indicates that approximately the same number CAUTI were observed in pediatric ICUs as predicted (Table 5).

Device Utilization Ratio

The presence of a medical device in a patient confers a risk of contamination of the device, which can lead to a healthcare-associated infection. Therefore, healthcare-associated infections can be prevented in part by decreasing the amount and duration of use of these devices. Because these devices have important clinical uses, there are limits to the possible reduction of device use, and therefore a balanced approach needs to be taken. The goal is to reduce the use as much as possible without interfering with necessary patient care. For this reason, device utilization is often reported as an indicator of HAI prevention activities in facilities, and as a measure of possible avoidable risk. Contrary to past reports, we are not reporting on the device utilization ratio in this report, because the statistics used to measure device utilization are being converted into a standardized device utilization ratio (an SDUR) by NHSN. National comparison benchmarks are not yet available for use. The metric can be used again when the national benchmarks are made available in 2017.

Surgical Site Infections

SSI occur when microorganisms infect a body site where surgery was performed. They are a significant cause of post-surgical morbidity and possible mortality, and can result in the need for hospital readmissions or extended courses of antibiotics.

In 2015, Connecticut's ACH reported 142 infections following colon surgical procedures (COLO), approximately 24% more than was predicted. This resulted in a statistically significant SIR of 1.24, indicating that more SSI following colon procedures were observed than were predicted based on

national data. Thirty-six infections following abdominal hysterectomies (HYST) were observed during 2015, twelve percent more than predicted. This resulted in an SIR of 1.12 which was not statistically significant (Table 6).

Table 6: 2015 Connecticut acute care hospital SSI SIR, by procedure type

Surgical Procedure	Procedure Count	Observed # SSI*	Predicted # SSI	State SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
Colon	3,693	142	114.43	1.24	1.05, 1.46	✖
Abdominal hysterectomy	3,586	36	32.07	1.12	0.80, 1.54	=

**In accordance with the CMS reporting requirement, these data include deep incisional primary and organ/space infections that occurred within 30 days of of inpatient procedures in patients that were 18 years of age or older at the time of surgery*

In past years, the SIR for SSI related to colon surgery has been consistently above 1.0, ranging between 1.2 and 1.5. Abdominal hysterectomy-related infections have been trending down from an SIR of 1.5 toward 1.0.

Hospital-onset Methicillin-Resistant Staphylococcus aureus Bacteremia and Clostridium difficile Infections in ACH

MRSA bacteremia and CDI are both serious infections which can cause considerable suffering and death. MRSA is an antibiotic-resistant infection and CDI can be fostered by antibiotic use. The incidence of hospital onset (HO) MRSA bacteremia[2] and CDI[3] became reportable to Connecticut DPH by ACH in 2013. HO means the specimen is collected greater than three days after admission to the hospital. The data are based on culture results from laboratories and, unlike the other HAI reported above, do not include other clinical information (fever, for instance), indicating infection.

In 2015, Connecticut's ACH reported 94 cases of HO MRSA bacteremia, 18% less than was predicted. This resulted in an SIR of 0.82, which was close but not statistically significant, indicating that a similar number of cases of HO MRSA bacteremia were observed as were predicted. For CDI, 1,315 HO cases were observed in 2015, 1% more than predicted. This resulted in an SIR of 1.01 that was not statistically significant, indicating that the number of cases of CDI observed was similar to the number predicted (Table 7).

Table 7: 2015 MRSA and CDI SIR, all Connecticut acute care hospital inpatient locations

Infection Type	Observed # of HO	Predicted # HO	# Patient Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
MRSA	94	114.70	1,831,481	0.82	0.67, 1.00	=
CDI	1,315	1,306.78	1,684,321*	1.01	0.95, 1.06	=

**NICU; specialty care nursery; labor, delivery, recovery, and post-partum; well-baby nursery; and well-baby clinic counts were subtracted from count per surveillance protocol*

[2] A positive laboratory test result for MRSA from a blood source

[3] A positive laboratory test result for *C. difficile* toxin A and/or B from an unformed stool sample

HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE RESULTS: LONG-TERM ACUTE CARE HOSPITALS

LTACH furnish extended medical and rehabilitative care to clinically complex patients, such as those with debilitating chronic conditions, or persons needing extended hospital care for more acute conditions. Such conditions could include trauma (e.g., severe automobile accidents) or chronic serious medical conditions (e.g., cancer, severe cerebral palsy). These conditions require a higher level of care than is generally available at long-term care facilities like skilled nursing facilities or nursing homes, and are similar in terms of the intensity of care needed – albeit for a longer period than is generally available at ACH. In 2015, the average number of beds per LTACH in Connecticut was slightly over 163; patient admissions averaged 725 per LTACH, and average patient days was 51,892. Three Connecticut LTACH reported HAI data into NHSN in 2015.[4]

Central Line-Associated Bloodstream Infections, All Bedded Inpatient Care Locations

During 2015, 8 CLABSI occurring in Connecticut LTACH were observed, approximately 62% fewer than was predicted. This resulted in a statistically significant SIR of 0.38 (Table 8).

Table 8: 2015 CLABSI SIR, Connecticut long-term acute care hospitals, all bedded inpatient care locations

Observed # CLABSI	Predicted # CLABSI	# Central Line Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
8	21.23	20,422	0.38	0.18, 0.72	★

Central Line-Associated Bloodstream Infections, Critical Care Locations and Wards

LTACH provide two levels of care, critical care and ward, which are typically provided in different patient care areas. Because the intensity of care is associated with different levels of patient risk for the development of HAI, LTACH CLABSI data are stratified into critical care and ward categories. Ward location data are further stratified into adult and pediatric.

There are currently four critical care locations reporting from Connecticut's LTACH. During 2015, five CLABSI were observed in critical care locations, approximately 46% less than predicted. This resulted in an SIR of 0.54 (Table 9). Howerver, this SIR is not statistically significant.

Table 9: 2015 CLABSI SIR, Connecticut long-term acute care hospital critical care locations

Observed # CLABSI	Predicted # CLABSI	# Central Line Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
5	9.26	7,121	0.54	0.20, 1.20	=

[4] Although there are five LTACH in Connecticut, the analyses presented in this section include data for just three facilities; planned NHSN surveillance changes will allow the remaining two facilities to be analyzed together with other LTACH in future annual reports.

During 2015, three CLABSI were observed in Connecticut's 17 LTACH adult ward locations, approximately 75% less than predicted. This resulted in an SIR of 0.25 which is statistically significant. (Table 10).

Table 10: 2015 CLABSI SIR, Connecticut long-term acute care hospital adult ward locations

Observed # CLABSI	Predicted # CLABSI	# Central Line Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
3	11.92	13,243	0.25	0.064, 0.69	★

During 2015, no CLABSI were observed in Connecticut's single LTACH pediatric ward location; because fewer than one CLABSI was predicted, no SIR or confidence interval could be calculated.

Catheter-Associated Urinary Tract Infections, All Bedded Inpatient Care Locations

During 2015, thirty-seven CAUTI were observed in LTACH in Connecticut, approximately 50% more than predicted. This resulted in a statistically significant SIR of 1.50, indicating that more CAUTI were observed than were predicted (Table 11). While the acute care hospital CAUTI SIR decreased substantially in 2015 compared to 2014 due to the case definition change , the LTACH CAUTI SIR was stable. We do not know why a decrease was not observed in LTACH CAUTI SIR when it was in ACH, but it may be that the components deleted in the new definiton (fungal culutres and abnormal urinalysis with small concentrations of bacteria on culture) were more likey to be found in ACH patients than LTACH patients.

Table 11: 2015 CAUTI SIR, all Connecticut long-term acute care hospital bedded inpatient care locations

Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
37	23.68	11,347	1.50	1.07, 2.04	✖

Catheter-Associated Urinary Tract Infections, Critical Care Locations and Wards

As in the case of CLABSI data, LTACH CAUTI data are stratified into two categories: critical care and ward location data.

About one third of Connecticut's LTACH CAUTI occurred in critical care locations. Fifteen CAUTI were observed, 51% more than predicted. This resulted in an SIR of 1.51, which, though high, was not statistically significant (Table 12).

Table 12: 2015 CAUTI SIR, Connecticut long-term acute care hospital critical care locations

Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
15	9.95	3,978	1.51	0.88, 2.43	=

Twenty-two of Connecticut's LTACH CAUTI occurred in ward locations, 49% more than predicted. This resulted in an SIR of 1.49, which was not statistically significant (Table 13).

Table 13: 2015 CAUTI SIR, Connecticut long-term acute care hospital ward locations

Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
22	14.74	7,369	1.49	0.96, 2.22	=

It should be noted that, while critical care and ward location data separately do not achieve statistical significance, analyzing the two together does. This is because the number of observations is great enough to make it likely that the elevated CAUTI SIR in all LTACH bedded inpatient care locations is not due to chance alone, and would be a good area of focus programs to prevent CAUTI.

LTACH Hospital-onset Methicillin-Resistant Staphylococcus aureus Bacteremia and Clostridium difficile Infections

Hospital onset (HO) MRSA bacteremia[5] and CDI[6] in LTACHs became reportable to Connecticut DPH in 2013. HO means the specimen is collected greater than three days after admission to the hospital and are based solely on culture results from laboratories.

Ten cases of HO MRSA bacteremia were observed and 34 HO CDI cases were observed in Connecticut's LTACH in 2015 (Table 14). NHSN does not currently provide SIRs for LabID events such as MRSA and CDI in LTACH, and we do not have national-level rates for comparison. We will track this data as rates, until LTACH SIRs for MRSA and CDI LabID are available.

Table 14: 2015 MRSA and CDI rates, all Connecticut long term acute care hospital inpatient locations

Infection Type	Observed # of HO	# Patient Days	Rate
MRSA	10	155,247	0.064 per 1,000 patient days
CDI	34	155,337*	2.19 per 10,000 patient days

**NICU; specialty care nursery; labor, delivery, recovery, and post-partum; well-baby nursery; and well-baby clinic counts were subtracted from count per surveillance protocol*

HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE RESULTS: INPATIENT REHABILITATION FACILITIES

An inpatient rehabilitation facility (IRF) is a healthcare setting in which patients stay overnight in a medical facility and where they receive services designed to allow them to continue their physical recovery from illness with skilled nursing and medical management, and achieve better capacity to perform activities of daily living. Although most IRF are located on the campus of an ACH, some are free-standing and may even be independent facilities. All IRF in Connecticut are associated with an ACH, and only one has its own campus - the others are on the ACH campus. IRF offer programs for rehabilitation, consisting of clinical care from physicians, nurses, and other highly trained healthcare professionals, who implement a goal-oriented, organized program aimed at increasing patient capacity to live independently or in a less intensive medical facility setting. In 2015, the average number of beds per IRF

[5] A positive laboratory test result for MRSA from a blood source

[6] A positive laboratory test result for *C. difficile* toxin A and/or B from an unformed stool sample

was slightly over 20; patient admissions over the year averaged 284 per IRF, and average patient days was 3,488.

Catheter-Associated Urinary Tract Infections, All Bedded Inpatient Care Locations

During 2015, five CAUTI were observed in Connecticut IRF, approximately 7% less than predicted. This resulted in an SIR of 0.93, which was not statistically significant. (Table 15).

Table 15: 2014 CAUTI SIR, all Connecticut inpatient rehabilitation facility bedded inpatient care locations

Observed # CAUTI	Predicted # CAUTI	# Urinary Catheter Days	SIR	SIR 95% Confidence Interval	Comparison to National SIR Baseline
5	5.36	1,822	0.93	0.34, 2.07	=

HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE RESULTS: OUTPATIENT HEMODIALYSIS CENTERS

Hemodialysis is a therapy in which a machine filters fluids, salts, and wastes from the blood when a patient's kidneys are unable to adequately perform this task, and is an important part of health maintenance for an estimated 395,000 patients in the United States each year. The number of persons on outpatient hemodialysis in the United States is growing and is expected to continue to increase. Because hemodialysis requires the establishment of a vascular access site where the bloodstream may interface with medical equipment, it may place patients at risk for infection. Dialysis events are defined as either (1) certain types of HAI related to hemodialysis therapy, such as bloodstream infections and localized infections of the vascular access site; or (2) the receipt of antimicrobials. The type of vascular access for hemodialysis a patient has is an important predictor of whether a patient will develop a HAI, and each access type is strongly correlated with a given level of risk for infection. Access types include central venous catheters (CVC) categorized as nontunneled central lines; CVC categorized as tunneled central lines; grafts (typically made of synthetic materials); and fistulas (typically made of the patient's own blood vessels). CVC have the greatest risk of infection and fistulas the least. HAI related to hemodialysis may be prevented by strict adherence to certain core infection prevention practices including hand hygiene, catheter/vascular access care, reduction in the use of catheters in favor of fistulas, proper central line insertion (if used), infection-free insertion of grafts and formation of fistulas, catheter hub disinfection, and the application of antimicrobial ointments during dressing changes.

NHSN uses the term "dialysis event" (DE) for outpatient hemodialysis center surveillance because these events also include antibiotic starts, which is not strictly an infection. DE consist of five types. Access-related bloodstream infections (ARBSI), are any positive blood culture with the suspected sources reported as the vascular access or uncertain. Bloodstream infections (BSI), are any positive blood culture. Local access site infections (LASI), are the presence of pus, redness, or increased swelling of the vascular access site when ARBSI is not present. Vascular access infections (VAI), are either a LASI or an ARBSI. Intravenous (IV) antimicrobial starts are the number of times that any patients in the facility started to receive an antimicrobial (such as an antibiotic to treat a bacterial infection). Vancomycin is an antibiotic commonly used to treat serious or complex infections, including MRSA. NHSN does not yet use the SIR to track dialysis events, and instead uses rates of infections per 10,000 patient-months.

There were 44 outpatient hemodialysis centers in Connecticut in 2015. Ninety-one percent were members of large dialysis organizations (LDO). Connecticut's outpatient hemodialysis centers had 4,035 patients in 2015, and the average number of patient-months per facility was 865.

In the following table, Connecticut rates for 2015 are compared to the national 2014 DE rates because the 2015 national rates are not yet available, and might not be, if NHSN switches to DE SIRs.

Table 16: Rates of Dialysis Events by type, 2015

Type of Dialysis Event	Number of events	Patient-months	Event Rate/100 patient-months	NHSN Events/100 patient-months*	Comparison to 2014 National Rate
Access-Related Bloodstream Infection (ARBSI)	169	38,060	0.44	0.49	=
Bloodstream Infection (BSI)	256	38,060	0.67	0.64	=
Local Access Site Infection (LASI)	366	38,060	0.96	0.72	✖
Vascular Access Infection (VAI)	535	38,060	1.41	1.21	✖
Intravenous (IV) Antimicrobial Start	1,439	38,060	3.78	3.27	✖
Intravenous (IV) Vancomycin Start	1,019	38,060	2.68	2.47	=
All	3,784	38,060	9.94	8.8	

The data for these various infection types can be further broken down into rates for each access type (fistula, graft, etc.). The rates stratified by access type reveal more detail about infection risk for these procedures, which may help in designing targeted prevention activities in hemodialysis centers.

As the data in Table 16 show, Connecticut outpatient hemodialysis centers are similar to the rest of the country in bloodstream infections, but are performing worse in rates of infections relating to access sites. This suggest that more attention needs to be paid to the care of these sites to prevent infection.

PARTNERSHIPS AND HAI PREVENTION IN HEALTHCARE FACILITIES

Collection and review of HAI surveillance data is a first step that healthcare facilities and Connecticut DPH take to develop plans, partnerships, and actions to improve patient safety. The data are used to inform and direct prevention activities that include participating in collaboratives with other facilities to share and follow best practices as well as implementing facility-based initiatives to improve hand hygiene, disinfection procedures for medical equipment, and other preventive measures.

DPH and the medical community partner to perform HAI surveillance. Staff in the facilities (ACH, IRF, LTACH, and outpatient hemodialysis centers) gather and enter the data into NHSN. DPH epidemiologists review the data for completeness and accuracy, and prepare surveillance reports, such as this one. NHSN also permits healthcare providers in the facilities to access their own data to check on the quality

of their data and identify problem areas. DPH sponsors and participates in training and technical assistance meetings with staff from healthcare facilities on the use of NHSN and on HAI surveillance methods and improvement.

All ACH, LTACH, IRFs, and long term care facilities (LTCFs) licensed by Connecticut DPH have a program for the prevention, control, and investigation of infectious diseases. Nurses, physicians, medical technologists, and other professionals who have acquired special training in infection control or epidemiology manage these programs. Through their infection prevention and control programs, facilities strive to improve the care and safety of patients by following the recommendations and guidance and recommendations of public health agencies and patient safety organizations, such as Connecticut DPH and CDC, CHA, Qualidigm, and the ESRD Network.

Working in partnership with many healthcare facilities and organizations across the state, Connecticut DPH shares local and national best practices, tools and resources, and strategies for implementing prevention initiatives and garnering leadership support. Connecticut DPH convenes advisory groups consisting of consumers, healthcare providers, facility representatives, infection prevention staff, and healthcare and patient safety organizations. Conversely, DPH participates in collaboratives and advisory groups called by those partners to foster information sharing and coordinated action to address HAI prevention across the spectrum of healthcare. DPH has either hosted or participated in many public information campaigns, conferences and seminars on infection prevention and approaches for promoting quality improvement for infection prevention.

Recently, due to concern about Ebola and other serious emerging infectious diseases, as well as antimicrobial resistance in healthcare facilities, the federal government is supporting enhanced infection control technical assistance in infection control programs and outbreak response in healthcare facilities. CDC is promoting and supporting the key role public health can play in partnership with the medical community and healthcare facilities in these responses. In Connecticut, CDC funded DPH for a three-year "Infection Control Assessment and Response" (ICAR) initiative to offer onsite technical assistance to healthcare facilities, including ACH, LTACHs, LTCFs, and outpatient hemodialysis centers. The risk of antimicrobial resistance also requires collaboration between public health, laboratories, and healthcare providers, and healthcare facilities. CDC is also supporting the building the capacity for the Katherine Kelley State Laboratory to permit testing for Carbapenem-resistant Enterobacteriacea (CRE) and other serious antibiotic resistant bacteria and to participate in a national network to investigate outbreaks of highly resistant "superbugs."

FUTURE STEPS

Expansion of HAI reporting in Connecticut

As noted earlier, the Connecticut HAI Advisory Committee has advised DPH to align state HAI reporting with the Centers for Medicaid and Medicare Services (CMS) healthcare facility quality payment incentive programs (e.g., IPPS and QIP). These CMS measures in turn align with the advice of experts in the field and authoritative scientific and policy organizations, such as the federal Department of Health and Human Services National HAI Prevention Plan, position statements of the Council of State and Territorial Epidemiologists, and recommendations of the National Quality Forum.

Additional reporting requirements for both measures and facility types will be added in Connecticut in future years to ensure that Connecticut mirrors the future expansion in CMS reporting. Each fall, the measures required by CMS are presented to the Reportable Diseases Advisory Committee for review, and inclusion in the Commissioner's Reportable Conditions list promulgated each January.

There has been considerable expansion of reporting in the past four years. No upcoming changes are anticipated to current CMS reporting requirements soon, but we expect that in time long-term care facilities will be added to facilities that report their HAI to NHSN.

Rebaselining

As described earlier, the SIR is a statistic for tracking HAIs that calculates the "predicted" number of infections that a healthcare facility or facility location will see in each period based on the number of infections reported from similar facilities nationwide during a baseline period. The SIR is a proportion: the number of observed infections during a given reporting period divided by the number of infections predicted for that type of facility. The baselines currently used for tracking HAIs were developed several years before NHSN became very widely used nationwide. The baselines were developed for different HAIs during different baseline periods, and the case definition of HAIs have been modified over time as we learn more about them. For these reasons, we need to develop new baselines, in a process known as "rebaselining." The new baselines for HAIs were developed in 2015, and will be used for our reports starting with 2016 data. The general effect of this will be to reset the SIRs back closer to 1.0, because 2016 is closer to the new baseline year (2015) than to the old baseline years. What will not change is that we will continue to be able to track our progress, staring with a new baseline and with updated information.