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Maine Quality Forum

MEASURING TO IMPROVE

To: Senator Brakey, Representative Hymanson and Members of the Joint Standing Committee on Health and Human Services

FROM: Karynlee Harrington, Maine Quality Forum

CC: Anna Broome, Legislative Analyst; Commissioner Hamilton, DHHS; Joseph Bruno, Chair MQF

DATE: May 22, 2018

RE: Maine Quality Forum's Annual Report of HealthCare Associated Infections in the State of Maine

On behalf of the Maine Quality Forum and in collaboration with the Maine CDC, I am pleased to submit to the Joint Standing Committee on Health and Human Services our 2018 Annual Report on Healthcare Associated Infections in Maine.

The 2018 annual report provides a significant amount of information for two reporting periods defined in the report, on the specific HAI data that the Maine Health Data Organization (MHDO) collects from Maine hospitals and from the National Health Safety Network (NHSN) per MHDO Rule Chapter 270, Uniform Reporting System for Health Care Quality Data Sets.

Consistent with our observation over the last several years, while there remain opportunities for improvement on some of the measures and by specific hospitals, the data that we collect and report on show that Maine hospitals continue to make progress in reducing the incidence of healthcare associated infections.

Please do not hesitate to contact me with any questions and or concerns.

Karynlee

Maine Quality Forum

MEASURING TO IMPROVE

2018 Annual Report:
Healthcare Associated Infections in Maine

Submitted to:

Joint Standing Committee on Health and Human Services

Submitted by:

Karynlee Harrington, Director
Maine Quality Forum

May 22, 2018

This report is submitted by the Maine Quality Forum in collaboration with the Maine Centers for Disease Control as part of its legislative responsibility to provide an annual report to the Maine State Legislature on the status of healthcare associated infections in Maine.[1] The Muskie School of Public Service at the University of Southern Maine, under contract with the Maine Quality Forum, provided technical support in the preparation of the report.

NOTE: The *HAI Annual Report* that would have been released in 2017 was postponed due to data quality issues related to a major software update at the U.S. CDC's National Healthcare Safety Network (NHSN). The 2018 Report includes two data reporting periods.

We refer to the two HAI data reporting periods throughout the Report as the:

2016 Data Reporting Period – July 2015 through June 2016; and
2017 Data Reporting Period – July 2016 through June 2017

[1] 24-A MRSA §6951.

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Executive Summary

Healthcare Associated Infections (HAIs) are harmful, costly, and largely preventable.

Healthcare Associated Infections (HAIs) – infections occurring during a patient's medical treatment for other conditions – can lead to medical complications, longer hospital stays, and death. When the words "antibiotic resistance" and "superbug" make headline news,[2] the dangers of HAIs capture attention.

Major causes associated with HAIs include inadequate hand washing, uneven use of proven infection control procedures, patients who have weakened immune systems and bacteria becoming resistant to antibiotics. The good news is that these infections can largely be prevented. Many in Maine are working hard to prevent them.

The MQF's Annual HAI Report focuses on Maine hospital efforts and results.

Maine hospitals are required to report data to the Maine Health Data Organization (MHDO) on how often HAIs occur and on how well they follow recognized best practices designed to prevent:

- Central line catheter-associated blood stream infections;
- Ventilator-associated events[3];
- Lab-identified Methicillin-resistant *Staphylococcus aureus* (MRSA) bloodstream events[4]; and
- Lab-identified *Clostridium difficile* (*C. difficile*) events.

The Annual Report frequently refers to 12-month "reporting periods" beginning in July and extending through June of the reporting period year. Thus, the "2017 reporting period" refers to the 12-months covering July 2016 through June 2017.

Key trends over recent years

Overall, Maine hospitals have recently maintained the nation's lowest statewide occurrence of *C. difficile* bacteria LabID events.[5] Between the 2015 and 2017 reporting periods, Maine's three neonatal intensive care units achieved an overall 71% reduction in the rate of bloodstream infections associated with central line or umbilical catheters.

However, over the last two 12-month reporting periods, there have been some increase in the rate per 100,000 patient days for hospital-onset MRSA bacteria bloodstream infection events and for the rate per 1,000 patient days for central line-associated bloodstream infections (CLABSI) in adult and pediatric ICUs,

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[2] The U.S. CDC reports that bacteria with the Asian mcr-1 gene that makes them resistant to colistin, a "last resort" antibiotic, have now been detected in isolated cases in 18 U.S. states ("Tracking the mcr gene", U.S. CDC web page accessed at https://www.cdc.gov/drugresistance/tracking-mcr1.html on 4/2/2018). While no bacterium has yet been found to have universal resistance to all known antibiotics, the emergence of mcr-1 could bring that day closer. The origin of the colistin-resistant gene has been traced to the overuse of colistin on Chinese farm animals (Ruobing Wang, Lucy van Dorp, et.al., "The global distribution and spread of the mobilized colistin resistance gene mcr-1", *Nature Communications*, Vol. 9, Article #1179 (3/21/2018), accessed online at: https://www.nature.com/articles/s41467-018-03205-z on 4/2/2018).

[3] Mechanical ventilators are used to assist patients who need help with breathing. Ventilator-associated events are medical complications such as pneumonia, deep vein blood clots and peptic ulcers.

[4] "LabID event" refers to the discovery of a given bacteria or virus found in a patient's laboratory sample.

[5] Based on data downloaded from the "Healthcare Associated Infections - Hospital" page of the CMS "Hospital Compare datasets" website, accessed on April 12, 2018 at https://data.medicare.gov/Hospital-Compare/Healthcare-Associated-Infections-Hospital/77hc-ibv8

Medical, Surgical, Medical/Surgical and Mixed Acuity Units. Between the 2015 and 2017 reporting periods, Maine hospitals have also been reporting lower percentages of documented compliance with proven sets of best practices ("bundles") for preventing:

- Central line catheter-associated infections for patients in ICUs or Mixed Acuity Units;
- Central line catheter-associated infections when catheters are placed before, during or after surgery; and
- Ventilator-associated events

Infections to watch: MRSA and *C. difficile*

MRSA and *C. difficile* bacteria can both cause serious infections leading to longer hospital stays, higher medical costs and even death. MRSA bacteria give rise to special concern, because of their resistance to multiple types of antibiotics and new strains of drug-resistant *C. difficile* have become more virulent.

How to interpret the report's data charts for individual Maine hospitals

It is important to understand that the HAI data reflected in this report:

- May reflect a very small number of cases. For smaller hospitals, just one-or-two infections can make a large difference in rates;
- Is not risk-adjusted;
- Is self-reported by each Maine hospital, but subject to periodic state validation; and
- Counts success in complying with a defined set of infection prevention best practices ("bundles") only if full compliance with *all* elements of the bundle is properly documented in hospital records.

Working Together in Maine to Prevent HAIs

State agencies, hospitals, consumers and other groups are working together to prevent and reduce HAIs. Each group brings unique focus and expertise. Working together leads to collective success. The groups listed below are referenced in the full report.

Agency or Group	Mission/Action
Association for Professionals in Infection Control (APIC), Pine Tree Chapter	The APIC Pine Tree Chapter includes infection prevention specialists (IPs), from a range of healthcare settings, dedicated to supporting effective infection prevention and control. The chapter includes continuing education sessions at every monthly meeting, and hosts a Maine-New Hampshire education conference every two years. Through its on-going support and encouragement of board certification, the Maine chapter has achieved one of the highest IP board-certification rates in the nation. The chapter also plays an active role in Maine's HAI/AR Collaborating Partners Committee. (See Appendix G)
Healthcare Associated Infection/Antimicrobial Resistance (HAI/AR) Collaborating Partners Committee	The broad range of experts and stakeholders who make up the HAI/AR Collaborating Partners Committee advise the MQF and Maine CDC by assessing and analyzing the status of infection prevention in Maine and by recommending strategies for the reduction of healthcare associated infections across all healthcare settings. They also help Maine CDC draft the multi-year State HAI Prevention Plan. (See Appendix F)

Agency or Group	Mission/Action
Healthcentric Advisors Quality Innovation Network Quality Improvement Organization (QIN-QIO)	As the CMS-designated New England QIN-QIO, Healthcentric Advisors provides hospitals with no-charge training and technical assistance to prevent HAIs. They monitor data from the National Healthcare Safety Network (NHSN) to offer assistance to hospitals with higher-than-expected HAI rates. Healthcentric Advisors is also working with hospitals and nursing homes to develop common standards for sharing information when patients with infections are transported from one facility to another. (See Appendix I)
Maine Centers for Disease Control and Prevention (Maine CDC) HAI/AR Program	The Maine CDC HAI/AR Program: • tracks national and state HAI and AR trends; • develops and implements the federally mandated State HAI Prevention Plan (Appendix E); • conducts numerous training sessions across the state for healthcare personnel and helps continued development of an online training program for IPs in long-term care; • detects, monitors and responds to disease outbreaks; • promotes statewide antibiotic stewardship programs; • conducts targeted assessments at the request of facilities seeking to identify and fix gaps in their infection prevention practices; • promotes regional cooperation between hospitals and nursing homes to prevent *C. difficile*; • validates hospital submissions of HAI infection data to NHSN; • helps hospitals, public authorities and ambulance services prepare and assess readiness for outbreaks of highly infectious diseases; and • co-chairs the HAI/AR Collaborating Partners Committee. (See Appendix D)
Maine Health Data Organization (MHDO)	Sets reporting standards and collects HAI data from Maine hospitals for this and other reports, and hosts the CompareMaine website where consumers can find information on cost and quality for specific healthcare services across a variety of providers.
Maine Hospital Association (MHA)	The MHA offers education to encourage the adoption of best practices; is helping 21 hospitals participate in a CMS-sponsored Hospital Improvement Innovation Network program to reduce avoidable hospital-acquired conditions and readmissions; actively participates in the Maine HAI/AR Collaborating Partners committee; and collaborates in a program with Healthcentric Advisors and Maine CDC to foster regional cooperation between hospitals and nursing facilities working together to control and reduce the spread of *C. difficile*.
Maine Quality Forum (MQF)	The MQF publicly reports the status of HAIs in Maine to the State legislature each year with support from the Maine CDC and the Muskie School of Public Service; Co-Chairs the HAI/AR Collaborating Partners Committee and collaborates with the Maine Health Data Organization on promoting the transparency of health care cost and quality information. Contracts with an expert organization for annual validation of hospital HAI data.

Maine consumers and legislators play important roles in HAI prevention

Consumers can:

- Speak up or bring an 'advocate' to the hospital to ask:
  - "What are the doctors, nurses and staff doing to protect me from HAIs?"
  - "How can I prepare for surgery to reduce my infection risk?"
  - "Do I still need this catheter, or can it be removed?"; and
  - about any other questions or worries you have.
- Remind everyone, including visitors to clean their hands before they touch you, and remember to wash your own hands with soap and water before you eat;
- Not press for antibiotics if a doctor says they are *not* needed;
- If antibiotics are needed, ask your doctor to perform lab tests to make sure the right antibiotic is chosen and continue taking them for as long as your doctor tells you to;
- Tell your doctor if you've recently received healthcare in another country;
- Tell your doctor if you've recently taken antibiotics, followed within days by diarrhea three or more times a day for two days, or diarrhea with a new fever, severe abdominal pain or blood in your stool;
- Tell your doctor if you have redness, pain or drainage around your IV catheter or surgery site;
- Make sure you get the annual flu vaccine and that all your other vaccines are up to date[6];
- Be proactive about managing your own healthcare;
- When shopping, look for the "No Antibiotics Administered" label to avoid buying meat and poultry raised on antibiotic animal feed to speed faster growth;
- Quit smoking, eat a balanced diet, maintain a healthy body weight; and
- Follow all pre-hospitalization instructions including bathing.

Legislators can:

- Educate themselves and their constituents about the importance of preventing HAIs; and
- Support the work of the organizations tackling these issues through effective policy development and adequate financing.

Preventing HAIs requires ongoing vigilance and resources

As bacteria become more drug-resistant, they grow more deadly and more difficult to prevent. The national CDC reports an emerging threat of carbapenem-resistant Enterobacteriaceae (CRE), a relatively new family of what the CDC calls "nightmare bacteria"[7] even more difficult to treat than MRSA or *C. difficile*, due to their high levels of resistance to multiple antibiotics. Several new varieties of dangerous bacteria having resistance to colistin, a "last resort" antibiotic, first emerged in Asia, spread to Europe and have begun to show up in small numbers in other states. As of late February, the federal CDC reports that over 250 confirmed or suspected cases of the highly drug-resistant *Candida auris* fungus in the U.S. have been detected in states as close as Massachusetts.[8] *Candida auris* can cause serious

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[6] "Healthcare-Associated Infections: What Patients Can Do", U.S. Centers for Disease Control and Prevention, (Atlanta: March 2014, accessed on April 13, 2015 at: http://www.cdc.gov/hai/pdfs/patientsafety/HAI-Patient-Empowerment.pdf

[7] "Antibiotic Resistance Threats in the United States, 2013", U.S. Centers for Disease Control and Prevention, April 23, 2013, accessed at http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf on January 29, 2014.

[8] "Tracking *Candida auris*," U.S. CDC web page last updated on 3/22/2018 and accessed on 4/13/2018 at https://www.cdc.gov/fungal/diseases/candidiasis/tracking-c-auris.html

illness, is difficult to identify in all but a small number of the most advanced clinical laboratories, and can be extremely difficult to disinfect from hospital surfaces.

What are Healthcare Associated Infections (HAIs)?

Healthcare Associated Infections (HAIs) may occur during the course of healthcare treatment for other conditions. They can be transmitted in hospitals, nursing facilities and rehabilitation centers as well as outpatient surgery centers, dialysis centers, community clinics and other healthcare settings. They may also occur during the course of treatment at home.

Four infections together account for nearly half (47%) of all HAIs across the U.S[9]:

- Surgical site infections;
- Catheter-associated urinary tract infections;
- Central line catheter-associated bloodstream infections; and
- Ventilator-associated pneumonia.

HAIs are caused by a wide variety of common and unusual bacteria, fungi, and viruses. The most serious HAI threats result from the emergence of difficult-to-treat, drug-resistant bacteria. The federal CDC currently estimates the U.S. has 23,000 deaths each year due to antibiotic-resistant bacteria.[10] The emergence of drug-resistant bacteria is accelerated by the widespread overuse and misuse of antibiotics. While overprescribing of antibiotics represents a serious problem, about 80% (by weight) of all antibiotics sold in the United States are given to animals and the vast majority are used as additives in animal feed for livestock and poultry to promote faster growth. About 60% of the antibiotics used in agriculture are of the same types prescribed to treat human disease and their use directly contributes to dangerous antibiotic resistance.[11] Curbing antibiotic misuse has gained growing attention in Maine and nationally.

One of the most common drug-resistant bacteria is known as Methicillin-Resistant *Staphylococcus aureus* (MRSA). The U.S. CDC estimates that MRSA caused nearly 11,300 U.S. deaths in 2011, and that about 3,100 of those deaths were due to patients infected while in a hospital.[12] There are also serious concerns about infections from newly evolved, more virulent strains of *C. difficile,* now estimated to account for over 12% of hospital HAIs.[13] The federal CDC estimated the U.S. had 453,000 *C. difficile*

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[9] Magill, Shelly S., et. al., Multistate Point Prevalence Survey of Healthcare Associated Infections, The New England Journal of Medicine, March 27, 2014, 370:1198-1208.

[10] "Containing Unusual Resistance," CDC Vital Signs, U.S. Centers for Disease Control and Prevention, April 3, 2018, accessed from https://www.cdc.gov/vitalsigns/pdf/2018-04-vitalsigns.pdf on 4/4/2018.

[11] Paulson, Jerome A. and Zaoutis, Theoklis, "Nontherapeutic Use of Antimicrobial Agents in Animal Agriculture: Implications for Pediatrics", Pediatrics, December 2015, 136:1671-1677, accessed from http://pediatrics.aappublications.org/content/136/6/e1670 on February 8, 2015.

[12] "Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Methicillin-Resistant Staphylococcus aureus*, 2013", U.S. Centers for Disease Control and Prevention, March 16, 2015, accessed at: http://www.cdc.gov/abcs/reports-findings/survreports/mrsa13.pdf on March 72016.

[13] Op. cit., Magill

[footnote continued on next page]

infections in 2011, of which nearly two-thirds were healthcare-associated and nearly one-quarter were identified as hospital-onset infections.[14]

In 2013, the federal Centers for Disease Control (CDC) and Prevention published advisories on the emerging threat of Carbapenem-resistant Enterobacteriaceae (CRE), a family of "nightmare bacteria" even more difficult to treat due to their higher levels of antibiotic resistance.[15] In 2015, an outbreak of CRE at two Los Angeles hospitals resulted in three deaths.[16] Although not yet common in Maine, the U.S. CDC reports that by December 2017, patient CRE infections had become widespread throughout the 50 states.[17]

CRE bacteria primarily affect patients in acute and long-term healthcare settings who have compromised immune systems or whose care requires the use of invasive devices such as catheters. Due to CRE's enhanced drug-resistance, emphasis has been placed on prevention and early identification.

As of late February, the federal CDC reports that over 250 confirmed or suspected cases of the highly drug-resistant *Candida auris* fungus in the U.S. have been detected in states as close as Massachusetts.[18] *Candida auris* can cause serious illness, is difficult to identify in all but a small number of the most advanced clinical laboratories, and can be extremely difficult to disinfect from hospital surfaces.

What is the HAI financial burden?

Although HAIs occur with relatively low frequency, their impact is significant. Because these HAIs often occur when a patient has already been weakened by the original disease, surgery or an underlying medical condition, the resulting infections can be devastating. When they do occur, these infections often lead to serious illness, longer hospital stays, long term disability and even death.

Beyond the personal consequences to patients and their families, HAIs also contribute to higher overall healthcare costs. The CDC reports that in 2009, HAIs added an average $16,000 to $19,000 to each hospital patient's bill, and increased national healthcare costs by an extra $28.4 to $33.8 billion.[19]

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[14] Lessa, Fernanda C., et.al, "Burden of *Clostridium difficile* Infection in the United States", The New England Journal of Medicine, 372:825-834, Feb. 26, 2015.

[15] "Antibiotic Resistance Threats in the United States, 2013", U.S. Centers for Disease Control and Prevention, April 23, 2013, accessed at http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf on January 29, 2014.

[16] Terhune, Chad, "Superbug outbreak extends to Cedars-Sinai hospital, linked to scope," Los Angeles Times, March 4, 2015.

[17] "Tracking CRE", U.S. Centers for Disease Control and Prevention, February 27, 2018, accessed at https://www.cdc.gov/hai/organisms/cre/trackingcre.html on 4/4/2018.

[18] "Tracking *Candida auris*," U.S. CDC web page last updated on 3/22/2018 and accessed on 4/13/2018 at https://www.cdc.gov/fungal/diseases/candidiasis/tracking-c-auris.html

[19] Scott RD II. "The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention". Atlanta, GA: Centers for Disease Control and Prevention, Division of Healthcare Quality Promotion; March 2009. http://www.cdc.gov/HAI/pdfs/hai/Scott_CostPaper.pdf

[footnote continued on next page]

Although healthcare associated infections are a national and state problem, patients, caregivers and healthcare providers can employ some basic and effective strategies to reduce and even eliminate the threat:

- safer use and maintenance of medical devices (e.g., mechanical ventilators and catheters);
- training staff on proper procedures for post-surgical care;
- the physical layout of hospital rooms (e.g., movement to private rooms to reduce spread of infections); and
- greater emphasis on hand hygiene.

While most of the state's initial efforts have been focused on hospitals, where patients are more at-risk, Maine is working to broaden attention to other healthcare settings. Medical care that once occurred primarily in hospitals has branched out to ambulatory surgical centers, nursing facilities, and the home. Many of the HAIs in these additional settings occur due to poor basic infection-control.[20] The U.S. CDC has traced a number of recent HAI outbreaks in outpatient clinics, surgical centers and doctor's office to practices such as improper sterilization and disinfection methods, reuse of syringes and needles, and using single-use medication vials for multiple patients.[21]

How does Maine measure HAIs?

The Maine Quality Forum (MQF) is required by Statute to adopt a set of measures to evaluate and compare health care quality and provider performance. The quality measures adopted by the MQF are the basis for rules adopted by the Maine Health Data Organization (MHDO). The rules under Maine Chapter 270, the *Uniform Reporting System for Quality Data Sets*, define these sets of health care quality measures, and the provisions for health care providers to submit these data to the MHDO. MQF makes recommendations and advises the MHDO Board about changes to Chapter 270, including the adoption of new measures. Rule Chapter 270 is a major substantive rule which means that changes must be reviewed and approved by the Maine Legislature.

Hospitals have been the central focus for HAI measurement and public reporting since infections in the acute care setting typically tend to be more severe. Chapter 270 requires all Maine acute care and critical access hospitals (with the exception of the Togus Veterans Administration Medical Center) to report quarterly data to the MHDO on each HAI measure using a consistent and standard format. Since 2009, these requirements have included the Healthcare Associated Infection (HAI) Quality Data Set.[22]

The rules include two types of HAI measures: process measures and outcome measures.

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[20] "HealthyPeople 2020 Topics & Objectives: Healthcare-Associated Infections", U.S. DHHS, Office of Disease Prevention and Health Promotion, last modified September 6, 2012, accessed on April 1, 2013 at: http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=17.

[21] "Outbreaks and Patient Notifications in Outpatient Settings, Selected Examples, 2010-2014", U.S. CDC, July 10, 2015, accessed on 3/16/2016 at: http://www.cdc.gov/HAI/settings/outpatient/outbreaks-patient-notifications.html

[22] The Chapter 270 rule and the full list of hospital quality measures can be found at https://mhdo.maine.gov/_finalStatutesRules/Chapter%20270%20Quality%20Data.docx

1. ***Process measures*** focus on a hospital's documented compliance with specific practices or "bundles" of practices that research has proven to be effective in preventing HAIs (*e.g.*, hand hygiene). Process measures are straightforward to collect and to interpret and require no data adjustment for the severity of a patient's condition.
2. ***Outcomes measures*** assess whether facilities and providers have succeeded in reducing their HAI infection rates. The MHDO collects the required data in order to calculate:
    - the rates of central line catheter-associated bloodstream infections (CLABSI) for adults in intensive care, medical, surgical and medical/surgical units and in mixed acuity units for hospitals not having a dedicated unit in any of the other categories;
    - CLABSI infections in neonatal intensive care units;
    - MRSA bloodstream infection (BSI) LabID events[23]; and
    - *C. difficile* LabID events.

To protect patient confidentiality, MHDO collects all HAI-related quality measure data at either the hospital-wide, or hospital unit level. The MQF contracts with the Muskie School of Public Service at the University of Southern Maine to analyze the hospital data and prepare the results for this report.

The data and results appearing in the Annual Report are arranged by 12-month "reporting periods" beginning in July and extending through June of the reporting period year:

Reporting Period	Days included
2012	7/1/2011 to 6/30/2012
2013	7/1/2012 to 6/30/2013
2014	7/1/2013 to 6/30/2014
2015	7/1/2014 to 6/30/2015
2016	7/1/2015 to 6/30/2016
2017	7/1/2016 to 6/30/2017

[23] Instead of reporting the number of clinically diagnosed cases of MRSA or *C. difficile* infection, LabID event reporting counts the number of cases when the pathology lab identifies the presence of MRSA in a patient's blood or *C. difficile* in a patient sample. MRSA found in the bloodstream is, by definition, an infection. However, a patient can sometimes carry *C. difficile* bacteria in their body without becoming ill. Therefore, finding a *C. difficile* LabID event does not always mean the patient is infected. While the U.S. CDC recognizes *C. difficile* LabID event rates (the number of LabID events per 100,000 patient days) as a reasonably reliable proxy for infection rates, the reader should keep in mind that the *C. difficile* LabID event rate will almost always appear higher than the actual infection rate.

TABLE 1 summarizes the process and outcome measures currently collected in Maine and the period for which data are available. Appendix B provides a more detailed discussion of each measure. All measures are collected at the hospital-specific or hospital unit level. The MRSA and *C.* difficile LabID event rates appearing in this report reflect the data as it was reported by each hospital to the NHSN.

Table 1 – Summary HAI Process and Outcome Measures Collected Under Chapter 270

Type of Infection	Data Availability	Process Measures	Outcome Measures
Central line catheter-associated bloodstream infections (CLABSI)	July 2006 – June 2017	• Percent compliance with the Institute for Healthcare Improvement's (IHI) bundle of 5 evidence-based interventions for patients with intravascular central catheters in intensive care units (**HAI-3**) • Percent compliance with the 4 insertion-related evidence-based interventions for patients with intravascular central catheters placed preoperatively, in pre-operative areas, operating rooms and recovery areas (**HAI-4**)	• The weighted average rate of central line catheter-associated blood stream infections per 1,000 intensive care unit central line days[24] (**HAI-1**) • Number of catheter-related blood stream infections among neonatal intensive care unit patients per 1,000 central line catheter or umbilical days (**HAI-2**)
Ventilator-associated events (VAE)	July 2008 – June 2017	Percent compliance with all five evidence-based interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units (**HAI-5**)	No outcome measures collected
Type of Bacteria	**Data Availability**	**Process Measures**	**Outcome Measures**
Methicillin-resistant *Staphylococcus aureus* (MRSA)	July 2013 – June 2017	No process measures collected	Number of hospital-onset MRSA bloodstream infection events per 100,000 patient days
C. difficile	July 2013 – June 2017	No process measures collected	Number of hospital-onset *C. difficile* LabID events per 100,000 patient days

The HAI data collected by the MHDO and publicly reported by the MQF is based on nationally recognized quality measures whose specifications have been developed by organizations such as the federal CDC's National Healthcare Safety Network (NHSN), and the Institute for Healthcare Improvement (IHI). The MQF works with the Maine CDC, the Pine Tree chapter of the Association for Professionals in Infection Control, the Maine HAI/AR Collaborating Partners Committee and other stakeholders to add new measures or retire existing measures as the needs change over time.

[24] See the glossary in Appendix J for an explanation of "central line days".

How well is Maine preventing HAIs?

To summarize progress, the table below assigns each of the HAI quality indicators to one of four categories of statewide performance and change over time:

Category 1 – *Exemplary performance* – Maine's statewide infection rate (or LabID event rate) ranked among the top five states in the country, or the statewide average compliance rate for an infection prevention best practices measure was at 98 percent or better in the most recent reporting period.

Category 2 – *Improved performance* – The overall statewide average has improved compared to three years ago.

Category 3 – *Declining performance* – The overall statewide average has declined over the past three years.

Category 4 – *Newer or revised measures* – Data collection has been too brief to establish a trend.

The distribution of the overall statewide outcome and process measure results across these categories appears below. At the end of this section, we also summarize the most recent HAI results reported by the U.S. CDC. Although useful for comparing Maine's results to the national baseline, the federal data is not as current as the data presented in this report. To see how individual hospitals are performing under each measure, please refer to the page numbers identified in the following tables.

Category 1 Exemplary Performance: Maine ranked among the top 5 U.S. states, or the overall statewide performance rate was at 98 percent or better in the most recent reporting period.

Maine ranked among the top five states in the country for one HAI quality measure.

Measure Group	Description	Hospital-Specific Rates
C. difficile hospital-onset LabID event rate	Number of *C. difficile* hospital-onset LabID events per 100,000 patient days	Page 43

C. difficile hospital-onset LabID event rate

Outcome measure

According to data released by CMS, during the 12-month period between April 2016 and March 2017, Maine had the lowest rate in the nation for *C. difficile* hospital-onset LabID events (a nationally recognized proxy for *C. difficile* infections).[25]

[25] Based on data downloaded from the "Healthcare Associated Infections - Hospital" page of the CMS "Hospital Compare datasets" website, accessed on April 12, 2018 at https://data.medicare.gov/Hospital-Compare/Healthcare-Associated-Infections-Hospital/77hc-ibv8

Category 2 Improved Performance: The overall statewide average has improved compared to three years ago

The overall statewide average is better now than it was three years ago for one of the six measures for which we have comparable data going back at least three years.

Measure Group	Description	Hospital-Specific Rates
Central line catheter-associated blood stream infections (CLABSI)	Number of central line or umbilical catheter-associated blood stream infections in neonatal intensive care units (HAI-2)	Page 27

Central line catheter-associated blood stream infections (CLABSI)

Outcome measures (HAI-2)

Over the three years between the 2015 reporting period and 2017, the statewide rate of central-line and umbilical catheter infections per 1,000 central line days[26] in hospital neonatal intensive care units (NICUs) improved by more than 70% (falling from 2.75 infections per 1,000 catheter days to 0.79 infections). If the older rate had remained unchanged, Maine would have seen seven neonatal catheter-related blood stream infections instead of only two.

Category 3 Declining Performance: The overall statewide average has declined over the past three years

Hospital compliance with all three infection prevention best practices process measures has declined over the past three years.

Measure Group	Description	Hospital-Specific Rates
Central line catheter-associated blood stream infections (CLABSI)	Compliance with all 5 evidence-based interventions for patients with intravascular central catheters in intensive care units (HAI-3)	Page 29
	Compliance with the 4 insertion-related evidence-based interventions for patients with intravascular central catheters placed preoperatively, in pre-operative areas, operating rooms and recovery areas (HAI-4)	Page 32

Process measures (HAI-3, HAI-4 and HAI-5)

Overall, the statewide hospital rates of documented compliance with three sets of best practices for preventing infections declined over the past three state fiscal years. Documented compliance with best practices for preventing central-line catheter-related infections in intensive care settings (HAI-3) fell by over three percentage points (from 93.7% to 90.5%), and documented compliance with best practices for preventing infections related to central-line catheter insertions before, during or after surgery (HAI-4) fell nearly five percentage points from 96.9% to 92.0%. Both declines were statistically significant.[27]

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[26] See the glossary in Appendix J for an explanation of "central line days".

[27] The 3-year difference in the rates for both HAI-3 and HAI-4 were statistically significant below the 0.01 level, meaning it is very unlikely they were due to random chance. The glossary entry for statistical significance can be found in Appendix J

[footnote continued on next page]

Category 4 Performance Unchanged The three-year change in the overall statewide average was not statistically significant.

Hospital compliance with one performance measure changed over the past three years, but not enough for the difference to be statistically significant.[28]

Measure Group	Description	Hospital-Specific Rates
Ventilator-associated events	Percent compliance with all five evidence-based interventions for preventing ventilator-associated events (VAE) and other complications in intensive care unit patients with mechanical ventilation (ventilator bundle compliance) (HAI-5)	Page 35

Ventilator-associated events

Process measure (HAI-5)

The statewide rate of documented compliance with best practices for preventing complications such as pneumonia, deep vein blood clots and peptic ulcers among ICU patients on mechanical ventilators (machines to help patients who need assistance with breathing) fell by 0.6 percentage points in the three years between the 2015 reporting period and 2017. However, the size of the difference was not statistically significant.

Category 5 Revised Measures: Data collection has been too brief to establish a trend

In recent years, the federal Centers for Medicare and Medicaid Services (CMS) and the National Healthcare Safety Network (NHSN) have revised the data collection rules for two outcomes measures in a way that prevents a fair comparison with the reported rates for earlier years.

Measure Group	Description	Hospital-Specific Rates
Central line catheter-associated blood stream infections (CLABSI)	Number of central-line catheter-associated blood stream infections for patients in intensive care units, medical, surgical, and medical-surgical units, or mixed acuity units (HAI-1)	Page 23
Drug-resistant or virulent disease organisms	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Page 39

[28] See the glossary entry for "statistical significance" in Appendix J

[footnote continued on next page]

Central line catheter-associated blood stream infections (CLABSI)

Due to a federal and state change in the CLABSI HAI-1 data reporting requirements that took effect in 2015, the infection rates based on data collected in the last two 12-month reporting periods cannot be compared to the rates based on data from earlier years.[29]

MRSA hospital onset (HO) bloodstream event rates

The multi-year trend for MRSA bloodstream event rates was also affected by a similar change in federal data reporting requirements. Prior to 2015, MRSA reporting was limited to inpatient units only. Since then hospitals have also been reporting MRSA data for emergency rooms and patient observation units. As such, the MRSA results for the last two reporting periods cannot be compared to that of earlier years.

More detailed information can be found in the appendices

Individual hospital performance across all outcome and process measures is displayed in the charts and tables in Appendix B and Appendix C. The bar charts in this year's Annual Report include new symbols, "▲" and "▼", to identify hospitals whose performance was better or worse than the statewide rate by a larger difference than could be explained by the normal random chance.

The U.S. CDC's measures of Maine's HAI performance

The Federal CDC released its most recent edition of the *National and State Healthcare-Associated Infections Progress Report* in March 2017. Their report measures the incidence of HAIs based on the Standard Infection Ratio (SIR), the ratio between the actual number of HAIs to a risk-adjusted, expected number of HAIs. The report can be found online at:
http://www.cdc.gov/HAI/pdfs/progress-report/hai-progress-report.pdf

CMS includes data for several HAI measures in its Hospital Compare database

The federal Centers for Medicare & Medicaid Services (CMS) publish hospital quality data for larger hospitals, i.e., hospitals paid under the Medicare Prospective Payment System (PPS). This source includes data on additional healthcare-associated infection measures not included in Maine's Chapter 270, such as, catheter-associated urinary tract infections (CAUTI), and surgical site infections for colon surgery and abdominal hysterectomies. The most recent CMS HAI data can be found on the Medicare.gov website at:
https://data.medicare.gov/Hospital-Compare/Healthcare-Associated-Infections-Hospital/77hc-ibv8

[29] Prior to 2015, CMS only required medium and larger hospitals (all hospitals reimbursed under Medicare's Prospective Payment system or(PPS) to report adult and pediatric CLABSI data (HAI-1) for patients in their intensive care units (ICUs). During that same period, Chapter 270 had also required HAI-1 reporting for the smaller Critical Access Hospitals (CAH) and for Mixed Acuity units in hospitals that did not have a dedicated ICU. Beginning in 2015, CMS expanded their required to cover data reporting for Medical, Surgical, and Medical-Surgical units, and Maine Chapter 270 followed suit.
[footnote continued on next page]

Four Maine hospital face CMS penalties for HAI-related patient safety

In mid-December 2017, CMS announced a one-year 1% reduction in Medicare payments for four Maine Prospective Payment System[30] (PPS) hospitals that ranked nationally in the bottom quarter for poor healthcare-acquired condition scores in CY 2016 (down from 8 Maine hospitals penalized in 2015). Infection rates account for about four-fifths of each hospital's score. The scores include risk-adjusted rates of central-line catheter bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), MRSA, *C. difficile* and surgical site infections (SSI).[31]

What prevention activities are underway in Maine?

Maine's State Healthcare Associated Infection Prevention Plan

Maine CDC began its HAI program in 2010 with federal stimulus funds. It has continued since then with continued support from the federal CDC. The Maine CDC HAI program:

- participates in monthly meetings with the Pine Tree Chapter of the Association for Professionals in Infection Control (APIC-PTC);
- Participates in regular meetings with the HAI/AR Collaborating Partners advisory group;
- analyzes process and outcome data for all Maine hospitals and reports findings to hospital management;
- has assisted Maine hospitals in reporting HAI infection data to the federal CDC;
- analyzes HAI and antibiotic resistance and trends to target prevention activities
- offers training sessions to long term care facilities throughout the state;
- has expanded and improved the capacity of hospital and state pathology labs to identify and confirm *C. difficile* and newly emerging and more dangerous multidrug-resistant organisms and to prevent their spread when they appear;
- encourages healthcare systems and facilities, and conducts education sessions across the state to promote the adoption of Antimicrobial Stewardship (AMS) programs shown to be effective in reducing the spread of antibiotic resistance;
- uses the federal CDC's Targeted Assessment for Prevention (TAP) strategy which provides tools for a hospital to review their actual practices and procedures in order to identify gaps and provide facility-specific recommendations to address those gaps and prevent infections;
- works with other organizations to encourage and assist hospitals with high *C. difficile* infection rates to collaborate with surrounding nursing homes to adopt proven prevention methods;

[30] Rau, Jordan, "Medicare Penalizes Group of 751 Hospitals for Patient Injuries", Kaiser Health News, Dec. 12, 2017, web page: https://khn.org/news/medicare-penalizes-group-of-751-hospitals-for-patient-injuries/ accessed on 4/2/2018

[31] CMS rates each hospital on a score of one (best) – to – ten (worst) on each of four measures, CLABSI, CAUTI, SSIs and a composite Patient Safety Indicator comprised of eleven other types of patient complications. CMS then computes each hospital's total score by taking the average of all four measures. See the Hospital-Acquired Condition Reduction Program page on the Medicare.gov website.

- works with other state and federal agencies to help hospitals, public authorities and ambulance services train and prepare readiness in order to safely address a patient with a highly infectious disease, such as Ebola;
- promotes public awareness of antibiotic resistance and how patients can help prevent it;
- has worked with psychiatric hospitals to standardize surveillance for HAI and antibiotic-resistant infections; and
- monitors and coordinates the response to outbreaks of healthcare associated infectious diseases and new or unusual multi-drug resistant disease organisms (MDROs).

Association for Professionals in Infection Control, Pine Tree Chapter (APIC-PTC)

APIC's Pine Tree Chapter holds monthly meetings and supports infection preventionists across the continuum of care by offering training programs in areas such as *C. difficile*, Ebola preparedness, best practices for CAUTI prevention, and emerging infections. They also keep members informed about national infection prevention initiatives and federal reporting requirements. The APIC Pine Tree Chapter also participates in Maine's new HAI/AR Collaborating Partners Committee (see below)

The APIC Pine Tree Chapter's annual report appears in Appendix G.

Maine Healthcare-Associated Infection/ Antimicrobial Resistance (HAI/AR) Collaborating Partners

The Maine HAI/AR Collaborating Partners, a statewide committee of healthcare professionals, state officials and consumer representatives from a broad variety of backgrounds, has been holding meetings to advise the MQF and the Maine CDC on strategies and approaches for reducing HAIs and antibiotic resistance in across all healthcare settings. The committee was very involved in assisting the Maine CDC in the development of the current, federally mandated HAI State Plan, and this year will be helping to develop a new multi-year State Plan. The Collaborating Partners have also made recommendations to MQF to amend to the list of HAI quality measures under Chapter 270 and to broaden its scope to include additional healthcare settings, such as nursing facilities and outpatient dialysis centers.

The stakeholders that comprise this group include infection preventionists from acute care and critical access hospitals and representatives from long term care, hospital pharmacists, infectious disease physicians, microbiologists, physicians, nurses, consumer representatives, the CMS-designated Quality Improvement Organization (QIO) for Maine, the Maine Hospital Association and the DHHS Division of Licensing and Regulatory Services. The MQF and Maine CDC co-chair this group with the support of staff from the Muskie School of Public Service at the University of Southern Maine. The group's Annual Report appears in Appendix F.

Online Curriculum for Infection Preventionists in Nursing Homes and Other Facilities

As previously noted, HAIs are not restricted to hospitals but can be found in other care settings, including nursing homes. However, due to high turnover rates, limited availability of national training programs specific to LTC and other factors, many individuals charged with the Infection Preventionist role at skilled nursing facilities have had little preparation and coordinated training for their work in

prevention, surveillance, control of active infections and performance improvement. In response, the MQF contracted with the Muskie School of Public Service to develop an online training core curriculum of general infection control and prevention practices, common infectious diseases, isolation/transmission precautions surveillance and data handling, performance improvement, and antibiotic stewardship. Both Maine CDC and APIC-PTC were actively involved in the curriculum development. Since it began in March 2016, 271 staff members from 132 nursing homes, hospitals and other healthcare facilities have enrolled. To date, infection preventionists and nurses account for 70% of participants. You can read more about the curriculum in Appendix H.

The CompareMaine website reports hospital data for MRSA and *C. difficile*

The MQF, in collaboration with the MHDO, provides the public with easy access to Maine healthcare cost and quality information via the CompareMaine.org website, which went online in November 2015. The website, supported by federal grants of approximately $2 million, offers consumers easy access to provider-specific cost and quality information on a variety of healthcare services and procedures. Consumer Reports has ranked CompareMaine as the second-best website of its kind in the county and gave it its highest scores for ease-of-use, scope and reliability.[32]

CompareMaine's quality measures include CMS-reported HAI data for calendar year 2016 on MRSA and *C. difficile* standardized infection ratios (SIRs), adjusted for differences in hospital characteristics. The SIR measures the ratio of the actual to expected number of infections. A SIR lower than 1.0 indicates a better-than-expected number of infections (compared to the national baseline rate), while SIRs above 1.0 indicate higher than expected infection rates. Visitors can also find hospital ratings from the national Consumer Assessment of Healthcare Providers & Systems (CAHPS®) patient experience survey[33] and on hospital performance in preventing serious complications. MHDO intends to include additional HAI measures in the future.

The Maine Hospital Association (MHA)

The MHA actively participates in the Maine HAI/AR Collaborating Partners committee; and collaborates in a program with Healthcentric Advisors and Maine CDC to foster regional cooperation between hospitals and nursing facilities working together to control and reduce the spread of *C. difficile*. The MHA, in association with the American Hospital Association's Health Research and Education Trust has also partnered with 21 Maine hospitals to participate in the CMS Hospital Improvement Innovation Network's (HIIN) program to reduce preventable hospital-acquired conditions and readmissions. The program's work focuses on 12 core topics subject to monthly data submission, over half of which are hospital-acquired infections, with the goals of reducing all-cause inpatient harm by 20 percent and readmissions by 12 percent by September 2018. Hospitals engaged in the project will receive on-site

[32] "Consumer-Facing Healthcare Cost and Quality Tools", Consumer Reports Issue Brief, (Yonkers, NY: Nov. 2016), p. 13.

[33] CAHPS is a series of patient surveys adapted to different healthcare settings and developed by the federal the Agency for Healthcare Research and Quality (AHRQ) to measure aspects of healthcare quality, such as whether doctors or nurses explained things in a way the patient could understand, explained the reason for taking a new medication, or provided written instructions on what symptoms to look for after going home.

and virtual technical assistance and coaching; cross-cutting resources targeting the harm areas; clinical topic-specific resources and peer-to-peer resources; virtual trainings and in-person events; and best practice hospital stories and case studies.

Healthcentric Advisors

As the CMS-designated Quality Improvement Network - Quality Improvement Organization (QIN-QIO) for the New England Region, Healthcentric Advisors provides hospitals with no-charge training and technical assistance to prevent HAIs. They monitor data from the National Healthcare Safety Network (NHSN) to offer assistance to hospitals with higher-than-expected HAI rates. Healthcentric Advisors is also working with hospitals and nursing homes to develop common standards for sharing information when patients with infections are transported from one facility to another.

Conclusions/Recommendations

Maine continues to show progress in addressing the risks associated with health care associated infections. The table below reports the status of the recommendations in the 2016 HAI Annual Report.

Recommendations from the 2016 Annual Report	Status
1. Continue to support the HAI/AR Collaborating Partners committee by asking it to review the choice of HAI-related quality measures included in Chapter 270 and by seeking its ongoing advice on the implementation of the new State HAI Plan.	The HAI/AR Collaborating Partners Committee held seven meetings between 2016 and 2017 and provided significant feedback and advise on the implementation of Maine CDC's 2015-2018 State of Maine Healthcare-Associated Infections Plan. The Committee also recommended amendments to the HAI sections of Maine Rule Chapter 270 and to expand its application to outpatient dialysis centers and skilled nursing facilities. MHDO hosts a section on its website to serve as an HAI information resource and repository for the Collaborating Partner group. https://mhdo.maine.gov/haiCPcommittee.htm
2. Support elements of the State HAI Plan, including the development of a statewide or regional conference to focus attention on HAI prevention.	Instead of hosting a bi-annual conference, Maine CDC determined it could reach a broader audience with greater frequency and at less cost by adding HAI prevention sessions to other educational events and regional workshops across the state.

Recommendations from the 2016 Annual Report	Status
3. Consider the feasibility of supporting the expansion of antibiotic stewardship efforts.	Maine CDC has expanded its efforts by hiring a new Antibiotic Resistance Coordinator, improving the capacity of hospital and state clinical laboratories to identify newly emerging and more dangerous multidrug-resistant disease organisms, conducting antibiotic stewardship education sessions for facilities and providers across the state, and using advertising and social media to promote public awareness of antibiotic resistance and how patients can help prevent its spread. MQF funded the development of an online certificate program for HAI prevention and antibiotic stewardship in long term care facilities.
4. Expand the CompareMaine.org website with a new a consumer education component on antibiotics and provide comparative information on pharmacy prescription prices via a link to the GoodRx.com website.	CompareMaine reports facility data on hospital-onset MRSA bloodstream events and *C. difficile* LabID event rates and provides a link to prescription price information on GoodRx.com. The MHDO consumer advisory committee has discussed different strategies on how best to inform and educate consumers on the issues specific to antibiotic resistance. As these strategies become more clear, expanding CompareMaine to include consumer education material may make sense.
5. Collaborate with the Maine CDC in building a strategy to expand the scope of HAI measure validation to all Chapter 270's HAI outcomes measures.	MQF has awarded a multi-year contract to JSI, Inc. to perform comprehensive external validation reviews of hospital data on an expanded range of HAI outcomes measures including all those required under Chapter 270 and other federally mandated HAI measures.
6. Develop the road map for statewide implementation strategy and awareness campaign of the extended care facility HAI training module and provide support for continued maintenance and regular updating.	Since going online in March 2016, Maine's Skilled Nursing Infection Prevention Program training website (see Appendix H) has enrolled 271 infection preventionists, nursing and other staff from 132 nursing homes, hospitals and other facilities in its 8-hour HAI prevention curriculum. Three new continuing education modules were added in 2017

HAI Recommendations for 2018

The Maine Quality forum will continue to support the following goals in the coming year:

1. Continue to support the HAI/AR Collaborating Partners Committee. This group will advise and assist in the development of the next federally mandated HAI State Plan for 2019-23, review HAI-related proposed amendments to Maine Rule Chapter 270 and to continue to review and make recommendations on other HAI/AR-related issues.

2. Submit to the MHDO Board of Directors the recommendation that Rule Chapter 270 be amended to include the collection of surgical site infection data for total knee and hip replacements and to include collecting *C. difficile* data from all Maine nursing homes.
3. Support the continued implementation the 2015-18 State HAI Plan and ongoing antibiotic stewardship efforts.
4. Continue to support an external validation program for HAI outcomes measure data submissions.
5. Expand the public reporting of all Chapter 270 HAI quality measures and to offer more consumer information on health care associated infections and antibiotic resistance.
6. Continue the development and promotion of the Skilled Nursing Infection Prevention online training program, and add a new training module on the nursing facility collection of *C. difficile* LabID event data envisioned under the proposed amendments to Chapter 270.

Appendix A: Maine hospitals listed by hospital peer group

The Maine hospital peer groups were created by the Maine Hospital Association (MHA) to facilitate comparisons between similar hospitals. The MHA revised the list and categories in April 2017.

Peer Group A

Central Maine Medical Center	Lewiston
Eastern Maine Medical Center	Bangor
Maine Medical Center	Portland
MaineGeneral Medical Center	Augusta/Waterville

Peer Group B

Aroostook Medical Center, The	Presque Isle/Fort Fairfield
Mercy Hospital	Portland/Westbrook
Mid Coast Hospital	Brunswick
Penobscot Bay Medical Center	Rockport
Southern Maine Health Care	Biddeford
St. Joseph Hospital	Bangor
St. Mary's Regional Medical Center	Lewiston
York Hospital	York

Peer Group C

Cary Medical Center	Caribou
Franklin Memorial Hospital	Farmington
Inland Hospital	Waterville
Maine Coast Memorial Hospital	Ellsworth
Northern Maine Medical Center	Fort Kent

Peer Group D (Critical Access Hospitals)

Blue Hill Memorial Hospital	Blue Hill
Bridgton Hospital	Bridgton
Calais Regional Hospital	Calais
Charles A. Dean Memorial Hospital & Nursing Home	Greenville
Down East Community Hospital	Machias
Houlton Regional Hospital	Houlton
LincolnHealth	Damariscotta
Mayo Regional Hospital	Dover-Foxcroft
Millinocket Regional Hospital	Millinocket
Mount Desert Island Hospital	Bar Harbor
Penobscot Valley Hospital	Lincoln
Redington-Fairview General Hospital	Skowhegan
Rumford Hospital	Rumford
Sebasticook Valley Health	Pittsfield
Stephens Memorial Hospital	Norway
Waldo County General Hospital	Belfast

Appendix B: Maine trends in hospital-reported HAI measures

This appendix describes each of the following measures which hospitals are required to submit and includes charts comparing hospital-specific rates and trend lines for each measure.

I. **Central line catheter associated bloodstream infections (CLABSI)**

- The annual weighted average rate for central line catheter-associated blood stream infections per 1,000 central line days in intensive care units, medical, surgical, and medical/surgical units, or in mixed acuity units (HAI-1).
- Number of catheter-related blood stream infections among neonatal intensive care unit patients per 1,000 central line catheter or umbilical days (HAI-2).
- Documented compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care units (HAI-3).
- Documented compliance with the four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas (HAI-4).

II. **Ventilator-associated events (VAE) and other complications**

- Percent documented compliance with all five evidence-based interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units (HAI-5).

III. **Methicillin-resistant *Staphylococcus aureus* (MRSA)**

- Hospital-onset MRSA bloodstream infection (BSI) LabID events per 100,000 patient days.

IV. C. difficile

- Hospital-onset *C. difficile* LabID events per 100,000 patient days.

It is important to understand that the HAI data reflected in this report:

- May reflect a very small number of cases. Among smaller hospitals, a large difference in rates can sometimes be due to just 1 or 2 cases;
- Is not risk-adjusted; and
- Is self-reported by each Maine hospital, but subject to periodic state validation.

Reporting periods are based on the following dates:

Reporting Period	Dates covered
2012	7/1/2011 to 6/30/2012
2013	7/1/2012 to 6/30/2013
2014	7/1/2013 to 6/30/2014
2015	7/1/2014 to 6/30/2015
2016	7/1/2015 to 6/30/2016
2017	7/1/2016 to 6/30/2017

Central line catheter associated bloodstream infections (CLABSI)

HAI-1: The annual weighted average rate for central line catheter-associated blood stream infections per 1,000 intensive care unit central line days[34]

HAI-2: Number of catheter-related blood stream infections among neonatal intensive care unit patients per 1,000 central line catheter or umbilical days

HAI-3: Documented compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care units

HAI-4: Documented compliance with the four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas

Some patients need large intravenous (IV) catheters – sometimes called "central lines" – which are inserted into the body to deliver concentrated solutions of drugs, to monitor special types of pressures, or to measure certain aspects of heart performance. For adults, central line catheters are ordinarily inserted into the large veins of the chest or into the heart itself. Neonates can also have central lines, but these lines may enter the body through the umbilical cord.

A central line associated bloodstream infection (CLABSI) is defined as, "a laboratory-confirmed bloodstream infection where [the] central line or umbilical catheter", had been in place for more than two days and the catheter was still in place on the day or day before the blood sample was taken.[35] These types of infections lead to longer hospital stays, increase the costs of care, and even increase the risk of patient death. Hospitals can prevent CLABSI by ensuring the proper insertion and care of the central line. Tracking how often CLABSI occurs may identify some opportunities for improvement, especially given that CLABSI is a relatively rare event in healthcare settings.

Central lines are an important tool for delivering medications and monitoring how well a patient's body is functioning. But because central line bloodstream infections can cause serious illness or even death and because they often cause longer hospital stays and high medical costs, it is important to take steps to effectively and efficiently reduce how often these infections occur.

Clinicians and researchers have studied CLABSI carefully and have developed strategies designed to lower the risk of central line related infections. These strategies have been grouped into "bundles" of best practices – practices that will reduce the risk of infection before and during insertion of the central line, and strategies to minimize the risk of infection while the central line is still in place.[36] There are standard definitions for these best practice bundles, which include the use of appropriate sterile barrier precautions, using chlorhexidine to cleanse the patient's skin prior to inserting the catheter, avoiding insertion of the central line in a femoral site, dressing the insertion site appropriately and removing the catheter at the earliest possible point in time. It is important that hospital personnel responsible for caring for patients who need a central line use these best practices to help reduce those patients' risk of bloodstream infection.

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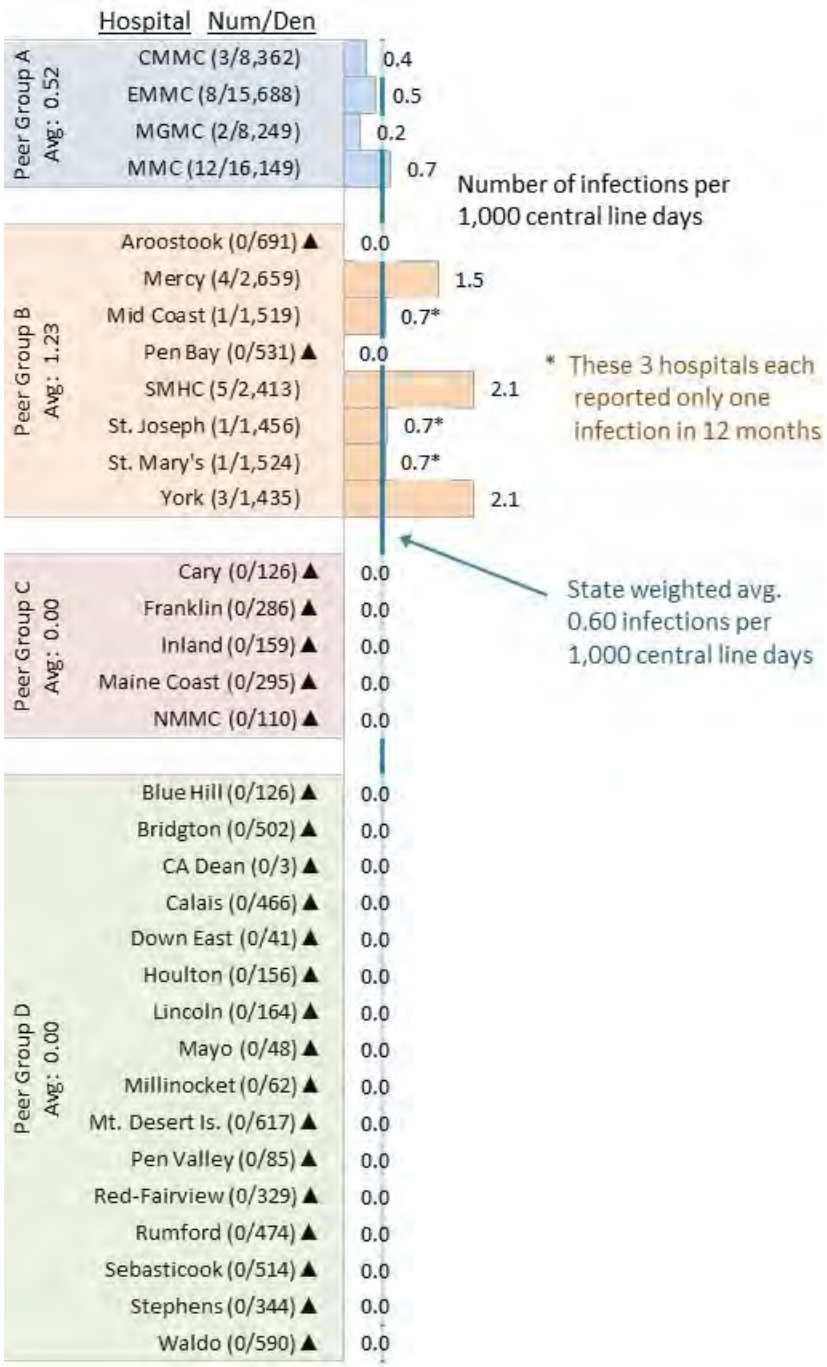
[34] See the glossary in Appendix J for an explanation of "central line days".

[35] "CDC Device Associated Module: Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central line-associated Bloodstream Infection", U.S. Centers for Disease Control and Prevention, April 2015, p. 4-3.

[36] "How-to Guide: Prevent Central Line-Associated Bloodstream Infections (CLABSI)". Cambridge, MA: Institute for Healthcare Improvement; 2012 accessed at: http://www.ihi.org/resources/Pages/Tools/HowtoGuidePreventCentralLineAssociatedBloodstreamInfection.aspx

HAI-1: Number of central line catheter-associated blood stream infections per 1,000 central line days among patients in intensive care units (ICUs), Medical, Surgical, Medical/Surgical and Mixed Acuity units. In the reporting period for 2016, those units reported 40 CLABSI infections across Maine. Twenty-three of the 33 hospitals using central-line catheters reported zero infections, while another 3 hospitals reported only one each. The hospitals are arranged by Peer Group.

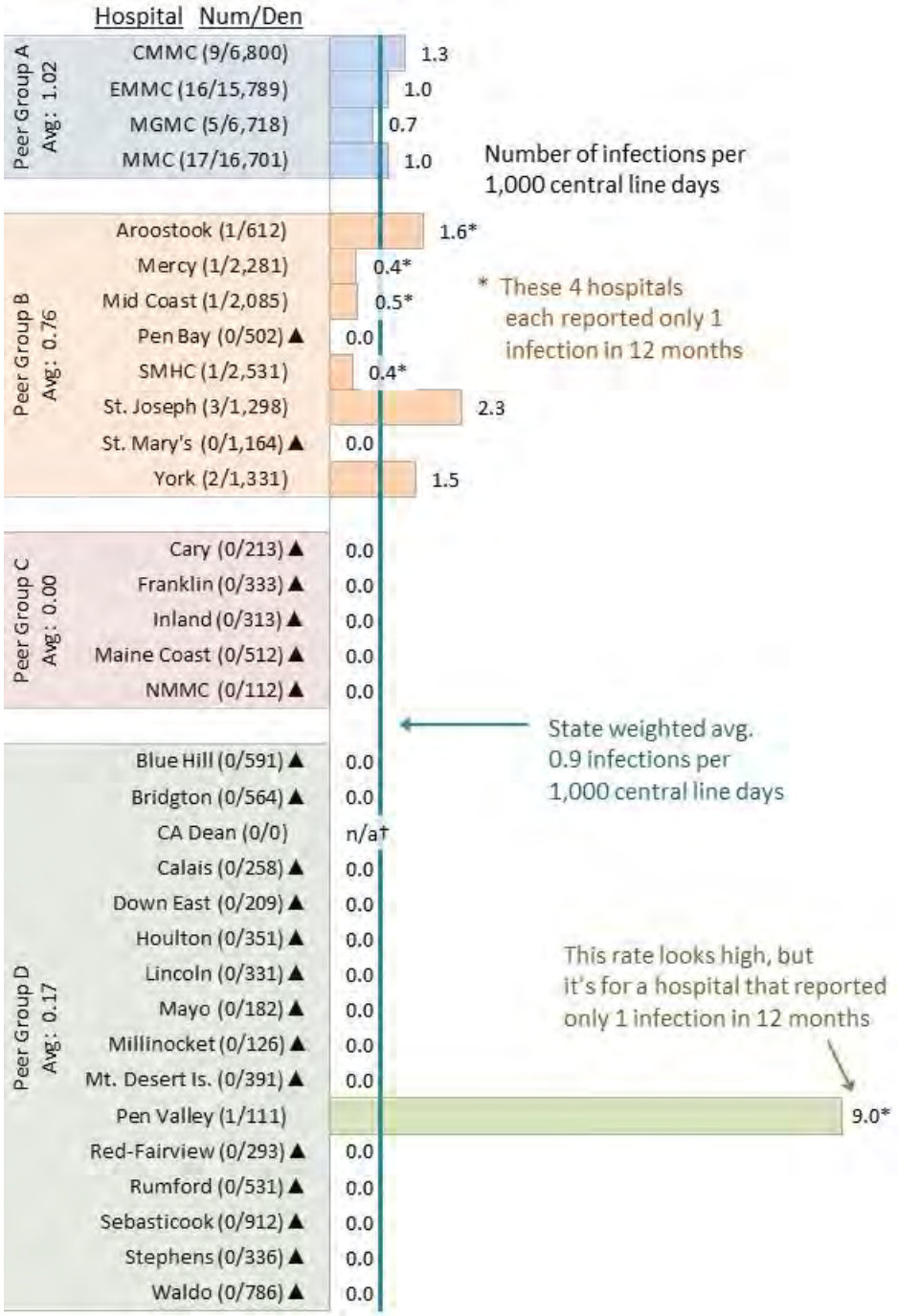
Chart 1a: Number of central line catheter-associated blood stream infections per 1,000 central line days, July 2015 – June 2016 *Lower infection rates are better*



▲ A hospital whose infection rate was statistically significantly better than the statewide average

HAI-1: Number of central line catheter-associated blood stream infections per 1,000 central line days among patients in intensive care units (ICUs), Medical, Surgical, Medical/Surgical and Mixed Acuity units. During the reporting period for 2017, those units reported 57 CLABSI infections across the state. Twenty-one of the 32 Maine hospitals that used central line catheters in the applicable hospital units reported zero infections in 12 months and another 5 hospitals reported having only one infection. The hospitals are arranged by Peer Group.

Chart 1b: Number of central line catheter-associated blood stream infections per 1,000 central line days, July 2016–June 2017 *Lower infection rates are better*



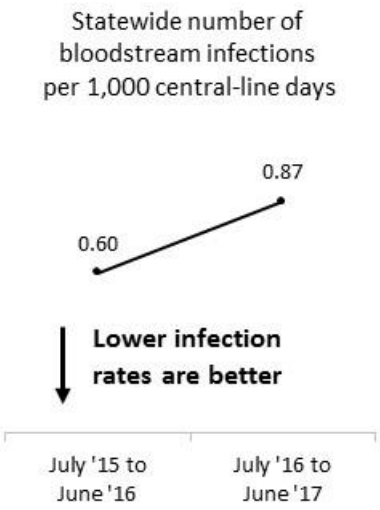
▲ A hospital whose infection rate was statistically significantly better than the statewide average

† A hospital reporting that it had no central line days

HAI-1 statewide trend: Number of central line catheter-associated blood stream infections per 1,000 central line days among patients in intensive care units (ICUs), Medical, Surgical, Medical/Surgical and Mixed Acuity units. Although MHDO has been collecting central line catheter-associated blood stream infection (CLABSI) data for many years; a 2015 change in the federal reporting requirements means that data collected during the last two reporting periods cannot be compared to data from earlier years. Before 2015, HAI-1 data collection was limited to adult and pediatric Intensive Care Units (ICUs), or to Mixed Acuity Units in hospitals that did not have a dedicated ICU. However, beginning in 2015, the federal Centers for Medicare and Medicaid Services (CMS) expanded the measure's scope by adding Medical, Surgical and Medical/Surgical units to the reporting list.

Between the 2016 and 2017 reporting periods, the statewide HAI-1 CLABSI rate rose from 0.60 infections per 1,000 central line days to 0.87 infections. Had the rate remained unchanged from the year before, Maine would have seen about 18 fewer CLABSI infections during the 2017 reporting period (about 39 or 40 infections instead of 57). Although the difference seems large, it was not statistically significant.[37]

Chart 2: Trend for the number of central line catheter-associated blood stream infections per 1,000 central line days, July 2015–June 2017

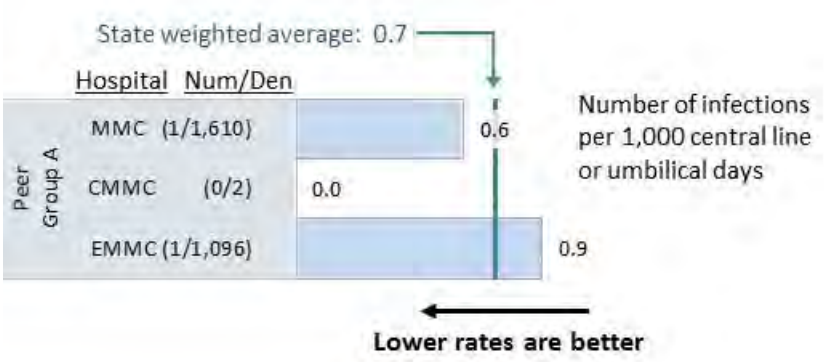


[37] See the glossary entry in Appendix J for an explanation of "statistical significance"**Statistical significance** .

HAI-2: Number of catheter-related blood stream infections among high-risk nursery patients per 1,000 central-line or umbilical catheter days, for the three Maine hospitals that used central line catheters in a neonatal intensive care unit (NICU), during the 2017 reporting period. Maine had two such infections in each of the two 12-month reporting periods displayed below and the statewide rates were similar to the rates seen for the HAI-1 measure. None of the differences between individual hospital rates and the statewide rate were statistically significant.[38]

Chart 3: Number of catheter-associated blood stream infections per 1,000 central line or umbilical days in neonatal intensive care units

July 2015 – June 2016



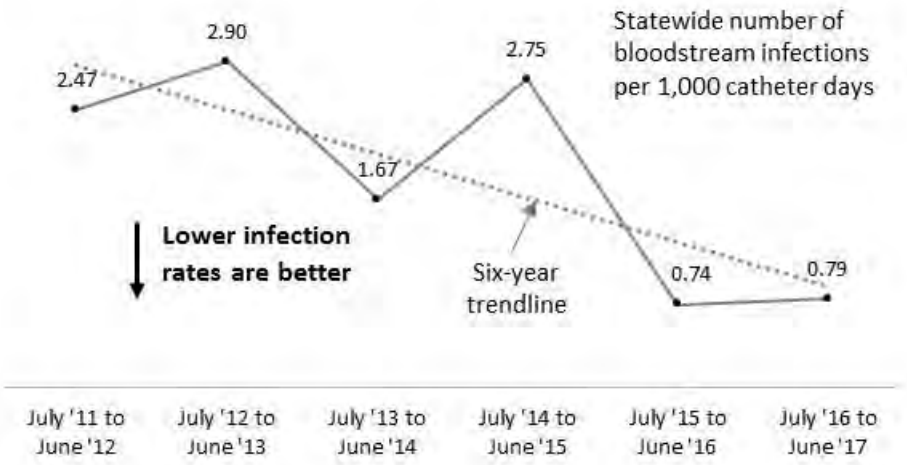
July 2016 – June 2017

[38] For an explanation, refer to glossary entry for "statistical significance".

HAI-2 statewide trend: Combined number of catheter-related blood stream infections (CLABSI) among neonatal ICU patients per 1,000 central-line catheter or umbilical days across the three Maine hospitals that have a neonatal ICU.

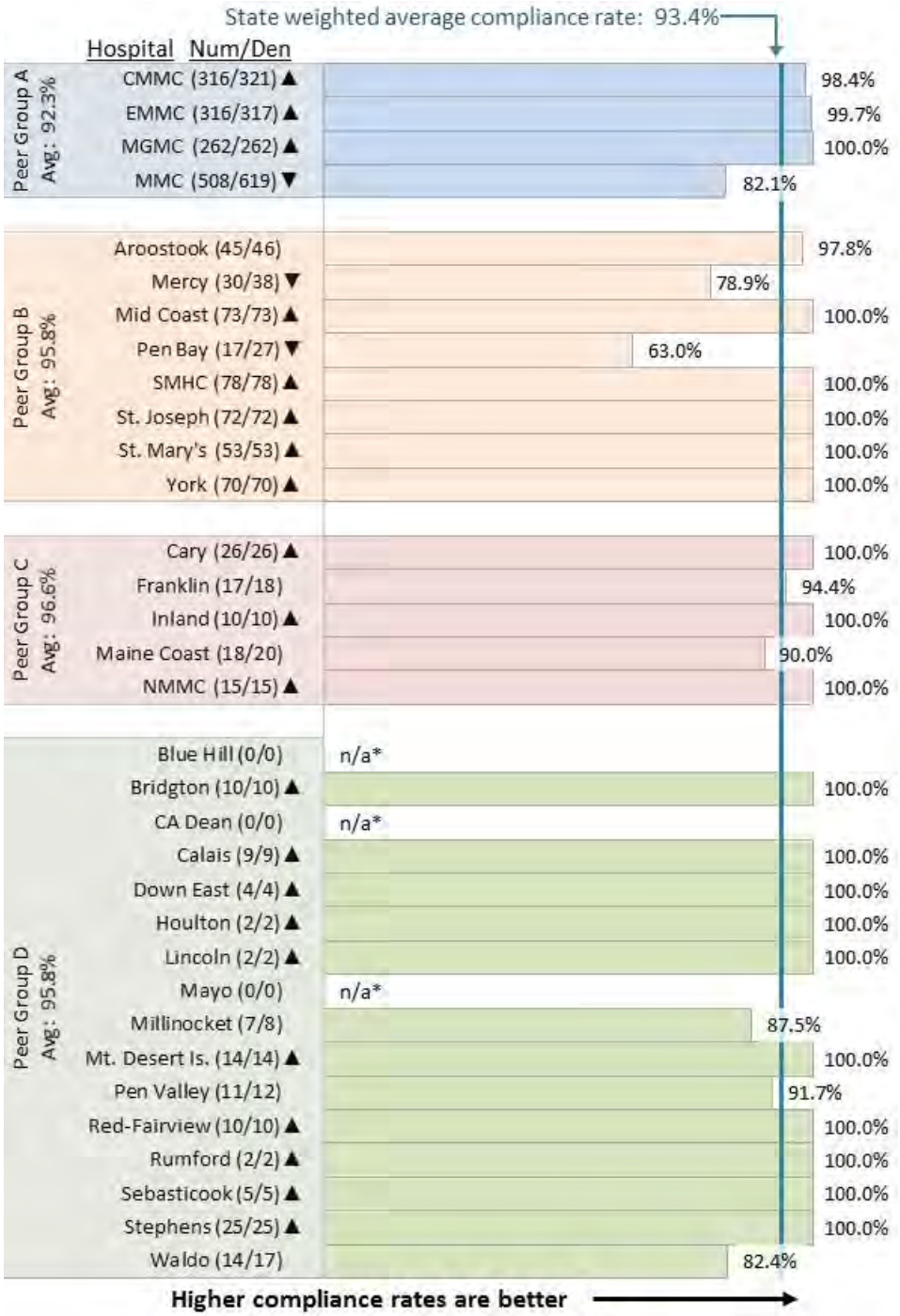
Over the three-year span between the 2015 and 2017 reporting periods, the statewide HAI-2 bloodstream infection rate fell to little over one-quarter of what it had earlier been. However, due to the small number of infections (just 7 infections during the 2015 reporting period and only 2 infections two year later) the difference was not statistically significant.

Chart 4: HAI-2 trend for catheter-associated bloodstream infection rates among NICU patients



HAI-3: The following chart displays each Maine hospital's rate of documented compliance with all five evidence-based interventions for patients with intravascular central line catheters (central line bundle compliance) in intensive care (or mixed acuity) units from July 2015 through June 2016. Hospitals are arranged by Peer Group.

Chart 5a: Rate of documented compliance with infection prevention best practices for central-line catheters in ICUs or mixed acuity units, July 2015 – June 2016

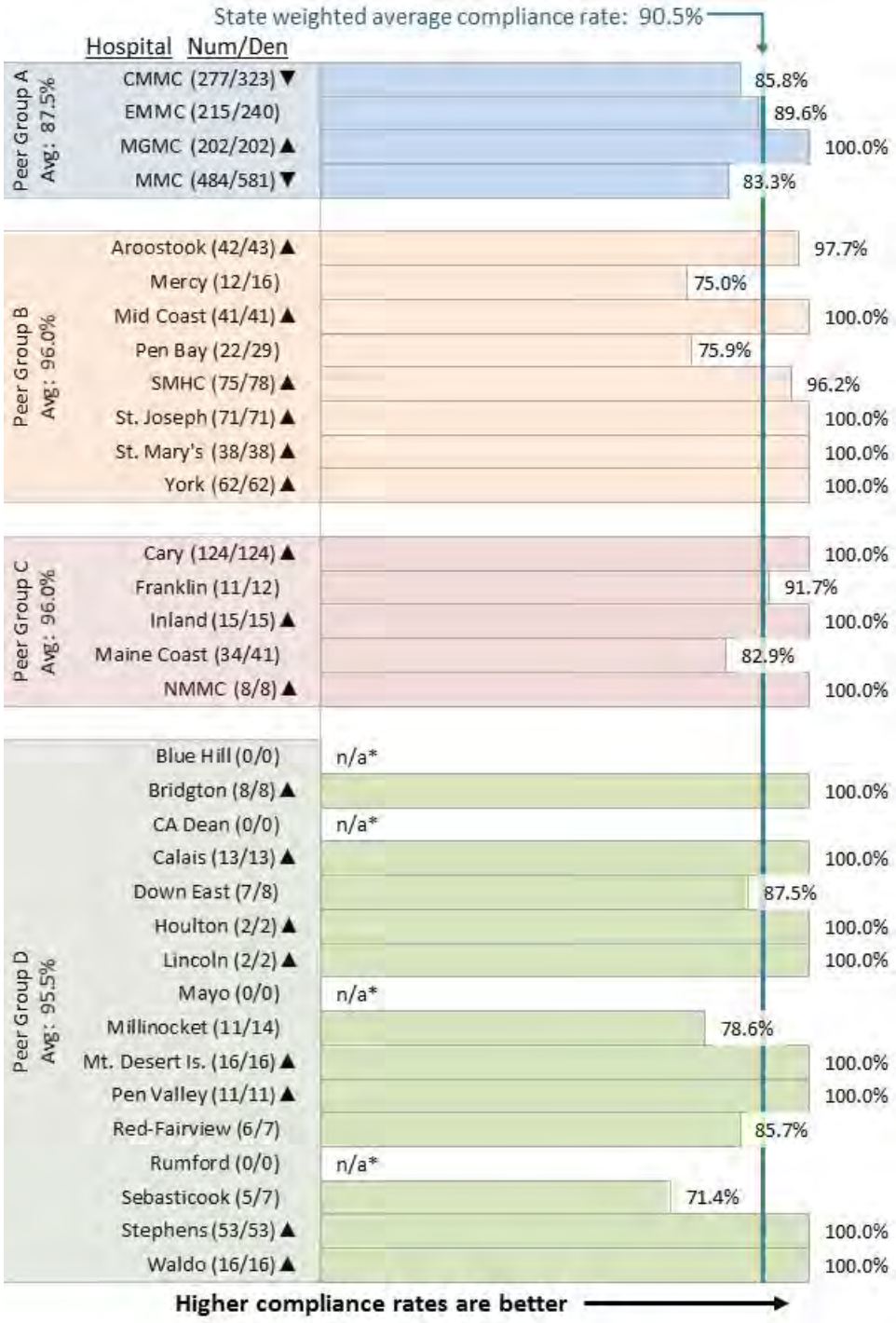


▲ A hospital whose infection rate was statistically significantly better than the statewide average
▼ A hospital whose infection rate was statistically significantly worse than the statewide average

* This hospital reported that the measure did not apply to any of its patients.

HAI-3: This chart displays each Maine hospital's rate of documented compliance with all five evidence-based interventions for patients with intravascular central line catheters (central line bundle compliance) in intensive care (or mixed acuity) units from July 2016 through June 2017. Hospitals are arranged by Peer Group.

Chart 5b: Rate of documented compliance with infection prevention best practices for central-line catheters in ICUs or mixed acuity units, July 2016 – June 2017



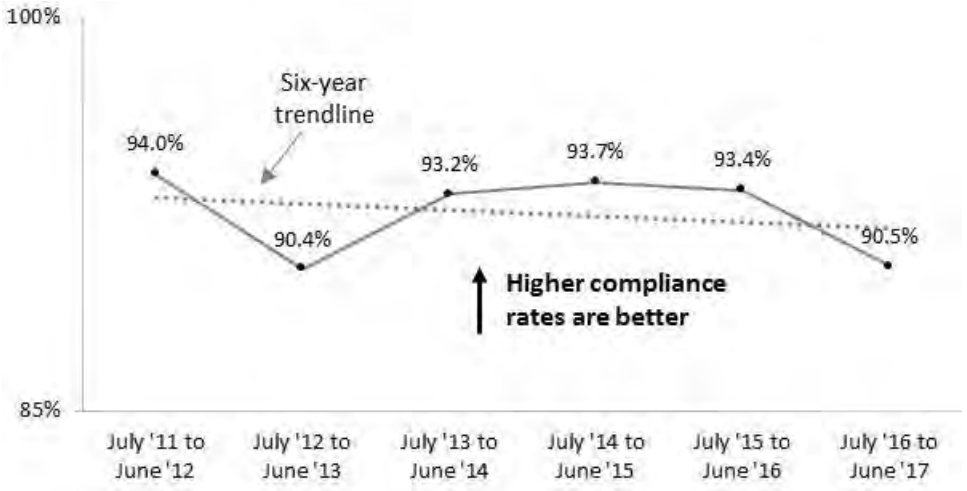
▲ A hospital whose infection rate was statistically significantly better than the statewide average

▼ A hospital whose infection rate was statistically significantly worse than the statewide average

* This hospital reported that the measure did not apply to any of its patients.

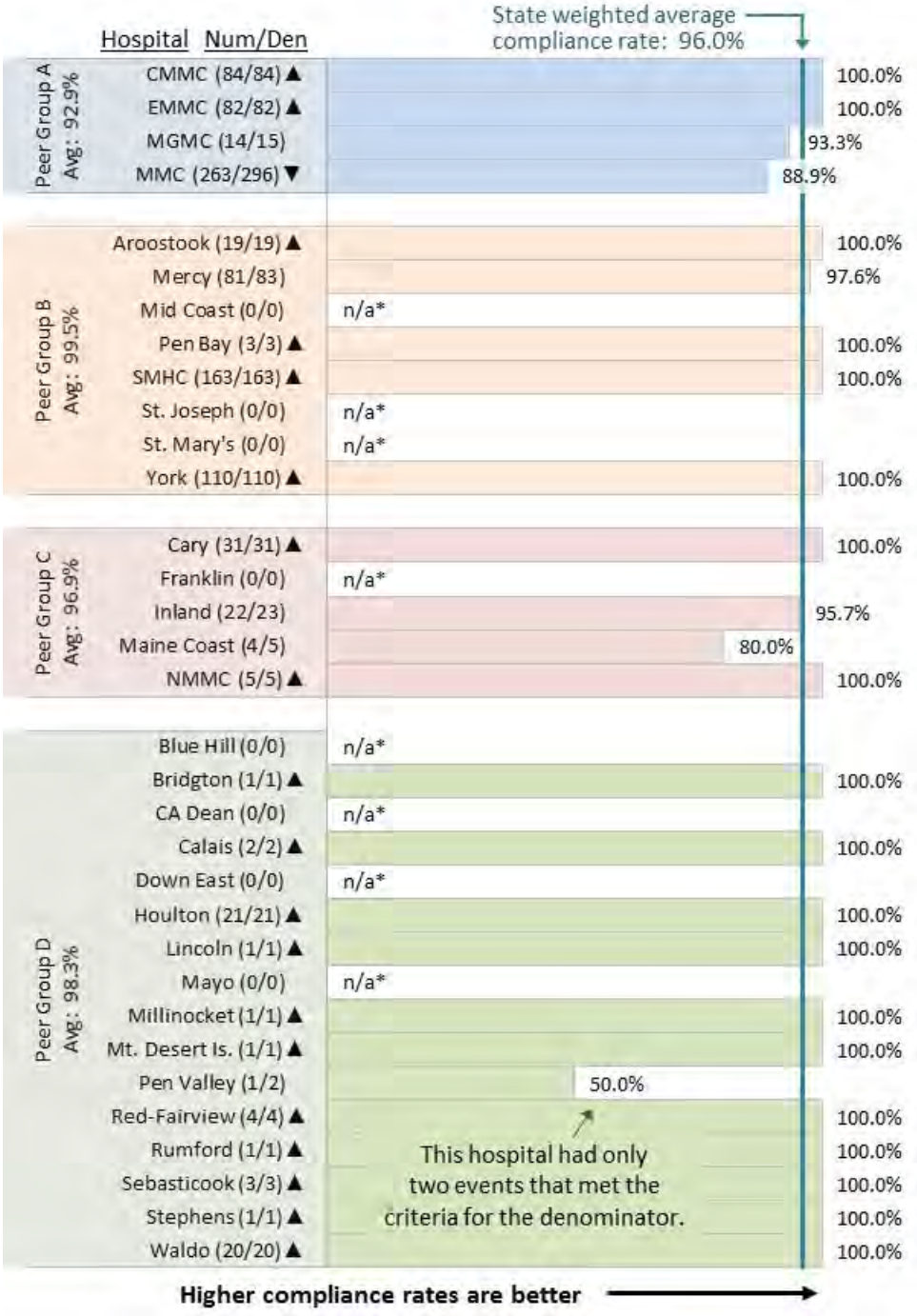
HAI-3 statewide trend: The annual statewide percentage rate of documented compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care (or mixed acuity) units across all Maine hospitals, July 2011 through June 2017. Over the last three reporting periods, the statewide compliance rate fell by 3.2 percentage points. Nineteen hospitals reported a perfect compliance rate during the most recent 12-month reporting period. The statewide data shows that in almost 1-out-of-10 cases, the hospital staff either did not follow all five catheter-related infection prevention best practices, or did not properly document their compliance.

Chart 6: HAI-3 trend for the rate of central-line catheter bundle documented compliance in ICUs or mixed acuity units



HAI-4: This chart displays each Maine hospital's rate of documented compliance with all four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed perioperatively, in pre-operative areas, operating rooms, and recovery areas during July 2015 through June 2016. Hospitals are arranged by Peer Group.

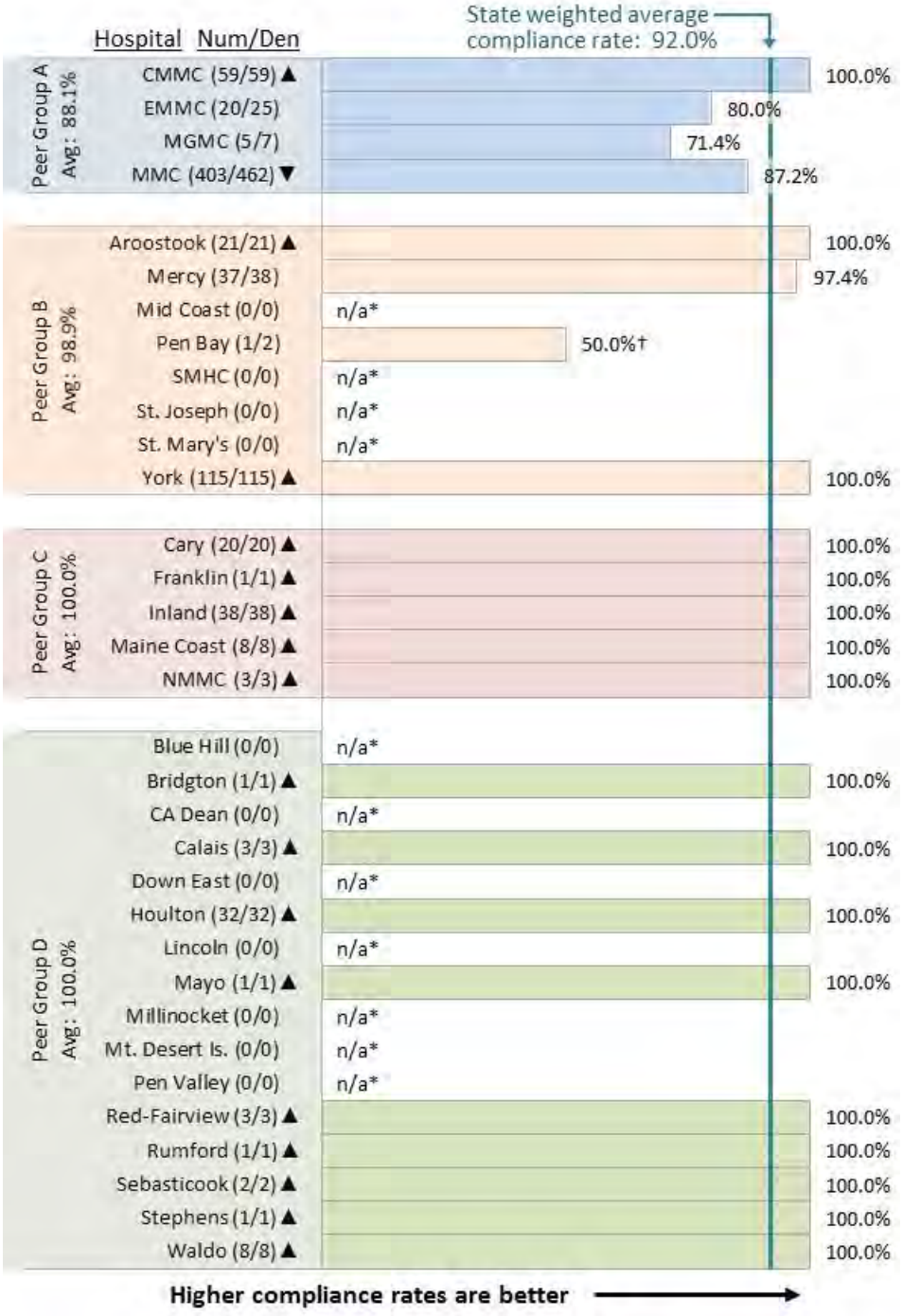
Chart 7a: Central-line bundle documented compliance rates for catheters placed before, during or after surgery, July 2015 – June 2016



▲ A hospital whose infection rate was statistically significantly better than the statewide average
▼ A hospital whose infection rate was statistically significantly worse than the statewide average
* This hospital reported that the measure did not apply to any of its patients.

HAI-4: This chart displays each Maine hospital's rate of documented compliance with all four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas during July 2016 through June 2017. Hospitals are arranged by Peer Group.

Chart 7b: Central-line bundle documented compliance rates for catheters placed before, during or after surgery, July 2016 – June 2017

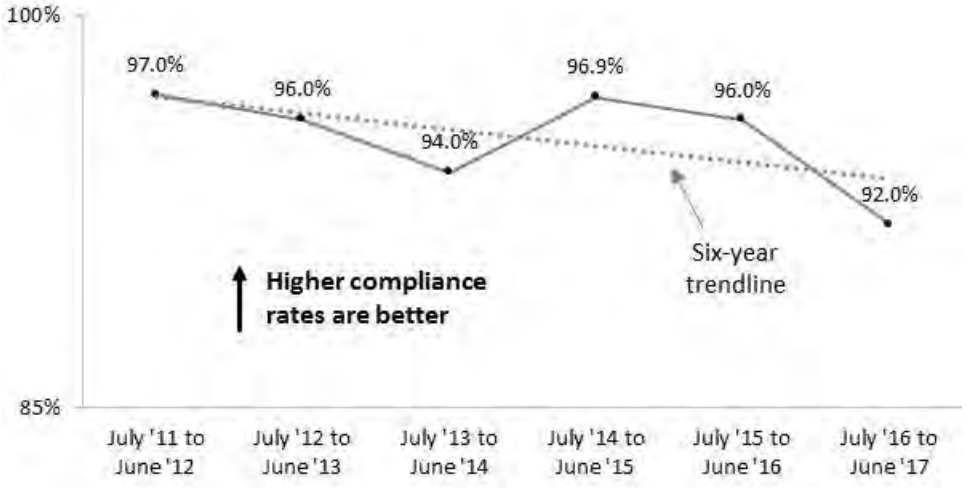


▲ A hospital whose infection rate was statistically significantly better than the statewide average
▼ A hospital whose infection rate was statistically significantly worse than the statewide average
* This hospital reported that the measure did not apply to any of its patients.

HAI-4 statewide trend: The annual statewide percentage rate of documented compliance with all four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas across all Maine hospitals, July 2011 through June 2017. Over the last three 12-month reporting periods, the statewide compliance rate fell by 4.9 percentage points from 96.9% to 92.0%. The difference in rates was statistically significant.

Seventeen hospitals reported a perfect compliance rate during the most recent 12-month reporting period. However, in nearly 8% of all cases statewide, the hospital staff either did not follow all four insertion-related infection prevention best practices, or did not properly document their compliance.[39]

Chart 8: HAI-4 trend for central-line catheter insertion-related bundle documented compliance for catheters placed in pre-operative areas, operating rooms, and recovery areas



[39] The difference in rates was statistically significant at below the P=0.01 level (see the glossary entry for "statistical significance").

Ventilator-associated events (VAE)

HAI-5: Percent documented compliance with all five evidence-based interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units

At times, it is necessary for a doctor to take steps to open a patient's airway, to allow air to flow freely to the lungs. An endotracheal tube can be used for this purpose. Inserted into the trachea, it acts as a passage through a patient's upper airway – this is commonly called "intubation". During surgery, intubation is used to ensure that a patient is able to breathe properly while under anesthesia. In the case of some critically ill patients, the tube is connected to a mechanical ventilator to ensure respiration in patients who cannot breathe on their own. Sometimes, patients who are intubated get serious complications such as pneumonia, peptic ulcers or deep vein blood clots; if the pneumonia occurs after the patient has been on mechanical ventilation it is referred to as "VAP" or ventilator-associated pneumonia. On any given day, about 18 percent of hospital inpatients on mechanical ventilation have VAP.[40] VAP and other ventilator-associated events can lead to increased severity of illness, greater risk of death, and longer, more expensive hospital stays.[41]

The risk of ventilator-associated complications can be related to a patient's pre-existing condition. They may have a suppressed immune system, chronic obstructive lung disease or other acute respiratory distress syndrome, which can make a patient vulnerable to pneumonia. If a patient is heavily sedated while on a ventilator they may be at increased risk of pneumonia, which can also be influenced by the position the patient is lying in (whether they are flat on their back or with head raised).

There are device-related risk factors for VAP, particularly with regard to how a specific device might influence secretions or lead to aspiration of bacteria into a patient's lungs. The most significant care worker-related risk factor is poor hand hygiene.[42]

Research has established a set (or "bundle") of five best practices that reduce the risk of VAP and other complications. The Ventilator Bundle includes elevating the head of the patient's bed, deep vein thrombosis prevention, peptic ulcer disease prevention strategies, daily sedation "vacations" (moderating the level of sedation) and daily assessment of a patient's readiness for removal of mechanical ventilation. When all five of these practices are followed, and used together, they produce even better outcomes than if any one of them were used alone.

The following charts show the percentage of times each Maine hospital, arranged by peer groups, have followed and documented the proper use of all five best practices in the Ventilator Bundle.

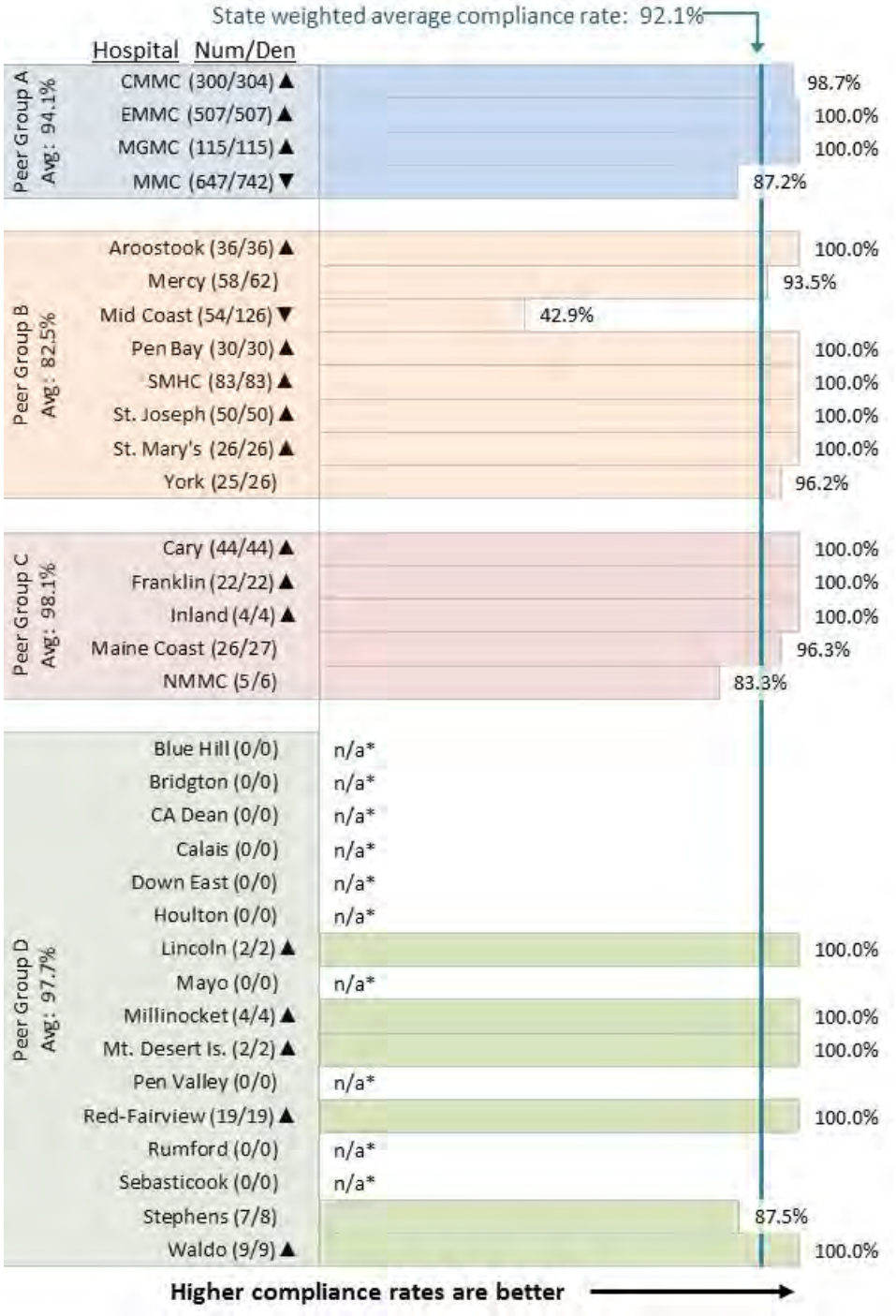
[40] Magill, op. cit., Supplementary Appendix, p. 12.

[41] Koenig SM and Truwit JD. Ventilator-associated Pneumonia: Diagnosis, Treatment and Prevention. Clin Microbiol Rev. 2006 October; 19(4): 637–657. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1592694/

[42] Allegranzi B and Pittet D, Role of hand hygiene in healthcare-associated infection prevention, Journal of Hospital Infection, 2009; 73:305-315.

HAI-5: The following bar graph displays each Maine hospital's rate of documented compliance with all five evidence-based, complication prevention interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units during the 2016 reporting period. Hospitals are arranged by Peer Group. Fifteen of the 23 hospitals using mechanical ventilators reported perfect compliance rates

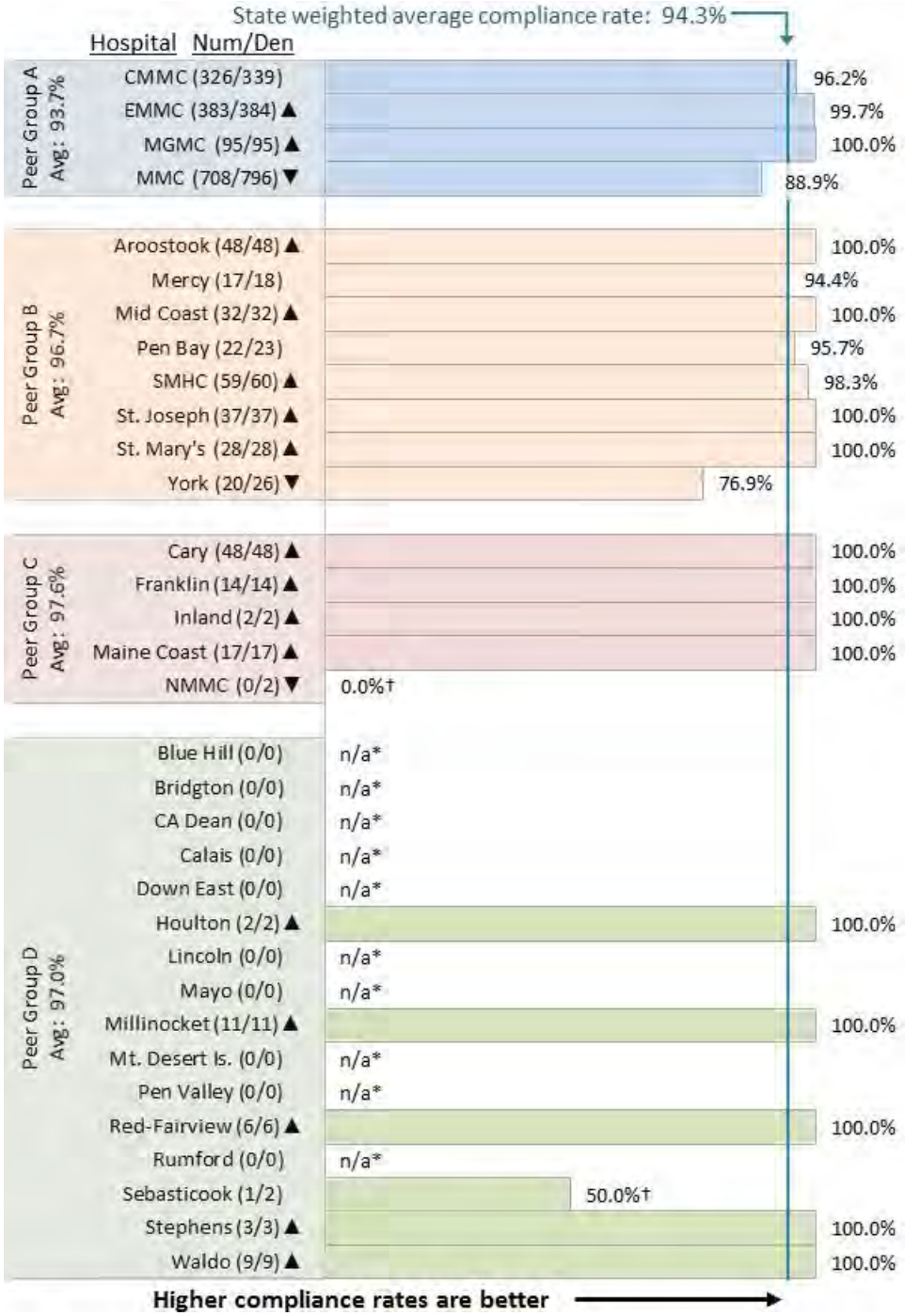
Chart 9a: Ventilator bundle documented compliance rates for patients in an ICU, July 2015 – June 2016



▲ A hospital whose infection rate was statistically significantly better than the statewide average
▼ A hospital whose infection rate was statistically significantly better than the statewide average
* This hospital reported that the measure did not apply to any of its patients.

HAI-5: The following bar graph displays each Maine hospital's rate of documented compliance with all five evidence-based, complication prevention interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units during the 2017 reporting period. Hospitals are arranged by Peer Group. Fourteen of the 23 hospitals using mechanical ventilators reported perfect compliance rates.

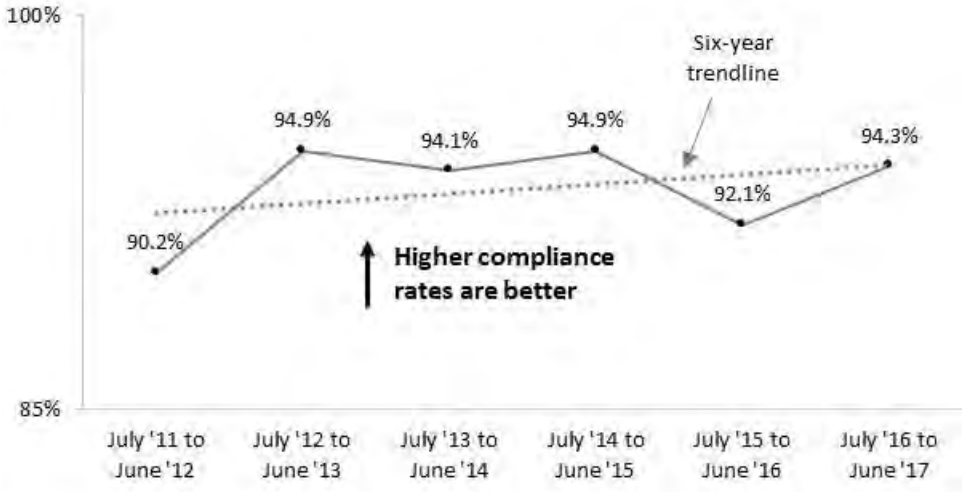
Chart 9a: Ventilator bundle documented compliance rates for patients in an ICU, July 2016 – June 2017



▲ A hospital whose infection rate was statistically significantly better than the statewide average
▼ A hospital whose infection rate was statistically significantly worse than the statewide average
* This hospital reported that the measure did not apply to any of its patients.
† This hospital reported that the measure applied to only two cases throughout the year.

HAI-5 six-year trend: Chart 10 displays the year-to-year change in the annual statewide percentage rate of documented compliance with all five evidence-based interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units from July 2011 through June 2017. Over the past three reporting periods, the statewide compliance rate fell by 0.6 percentage points, but the difference was not statistically significant. However, over the longer six-year span, the compliance rate had improved by 4.1 percentage points, and that difference was statistically significant.[43]

Chart 10: Six-year trend of HAI-5 ventilator bundle documented compliance rates for ICU patients



[43] See the glossary entry for "statistical significance" in Appendix J.

Methicillin-resistant *Staphylococcus* aureus (MRSA)

Methicillin-**r**esistant ***S****taphylococcus* ***a****ureus* – or "MRSA", is a family of antibiotic-resistant bacteria that can infect human beings. Although still called “Methicillin-resistant”, the term now actually applies to staph bacteria that are resistant to a number of antibiotics similar to Methicillin. This group of antibiotics is typically used to treat a staph infection. If the staph infection is from MRSA, its resistance to antibiotics can make it more difficult to treat.

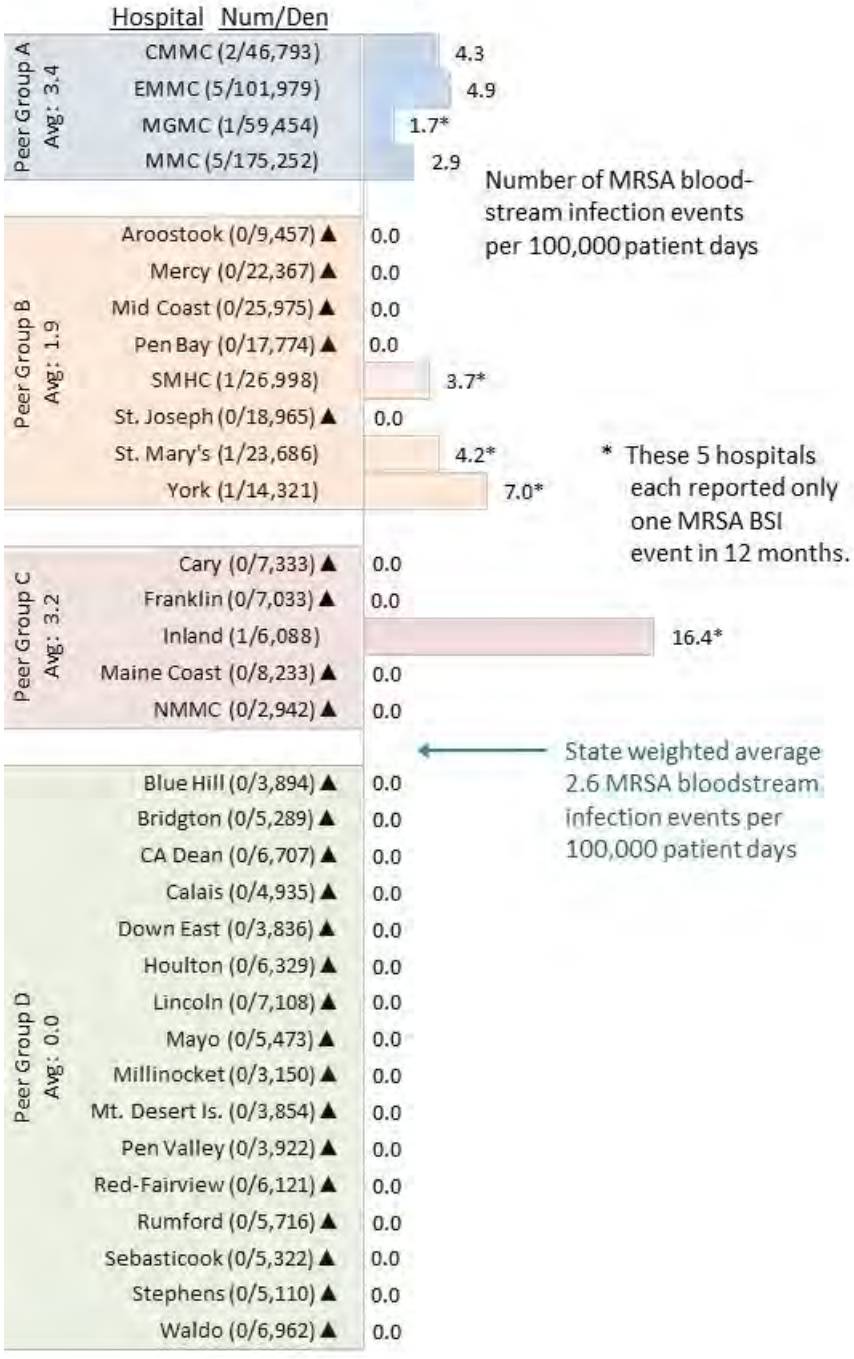
MRSA can be found in both the general community and health care facilities. A person can carry MRSA on their body without having an infection; this is called being “colonized” by the bacteria. MRSA infections are often seen in the form of relatively mild skin infections that cause sores or boils. In more serious cases it can infect wounds, surgical incisions and reach the bloodstream, the urinary tract and even the lungs.

Much of the time, MRSA infections are not life threatening, but when a person is already weakened by illness or surgery – such as people in hospitals or nursing facilities – MRSA can cause more serious illness and increase risk of death. MRSA infections can also cause higher costs because of longer hospital stays and greater health care utilization.

The State of Maine requires all acute care hospitals to report data on MRSA bloodstream infections to the federal CDC, and that data is then collected by the Maine CDC and MHDO. The charts on the following pages display how often the hospital lab finds MRSA bacteria in a patient’s blood sample (a “MRSA Bloodstream Infection (BSI) event”). To reduce the chance of counting patients who already had a MRSA infection at the time they entered the hospital, counting is limited to “Hospital-Onset (HO)” cases. A MRSA BSI event is classified as HO only when MRSA has not been detected in the patient’s blood until on or after the fourth day of an inpatient hospital stay.

MRSA: This chart displays Maine's facility-wide hospital onset (HO)‡ methicillin-resistant *Staphylococcus aureus* bloodstream Infection (MRSA BSI) event rates per 100,000 patient days during the 2016 reporting period. During those 12 months, Maine hospitals reported 17 HO MRSA BSI events, 25 of 33 Maine hospitals reported zero events, and 5 hospitals reported having only one. The hospitals are arranged by peer groups.

Chart 11a: Number of MRSA HO bloodstream infection events per 100,000 patient days, July 2015 - June 2016 *Lower bloodstream event rates are better*

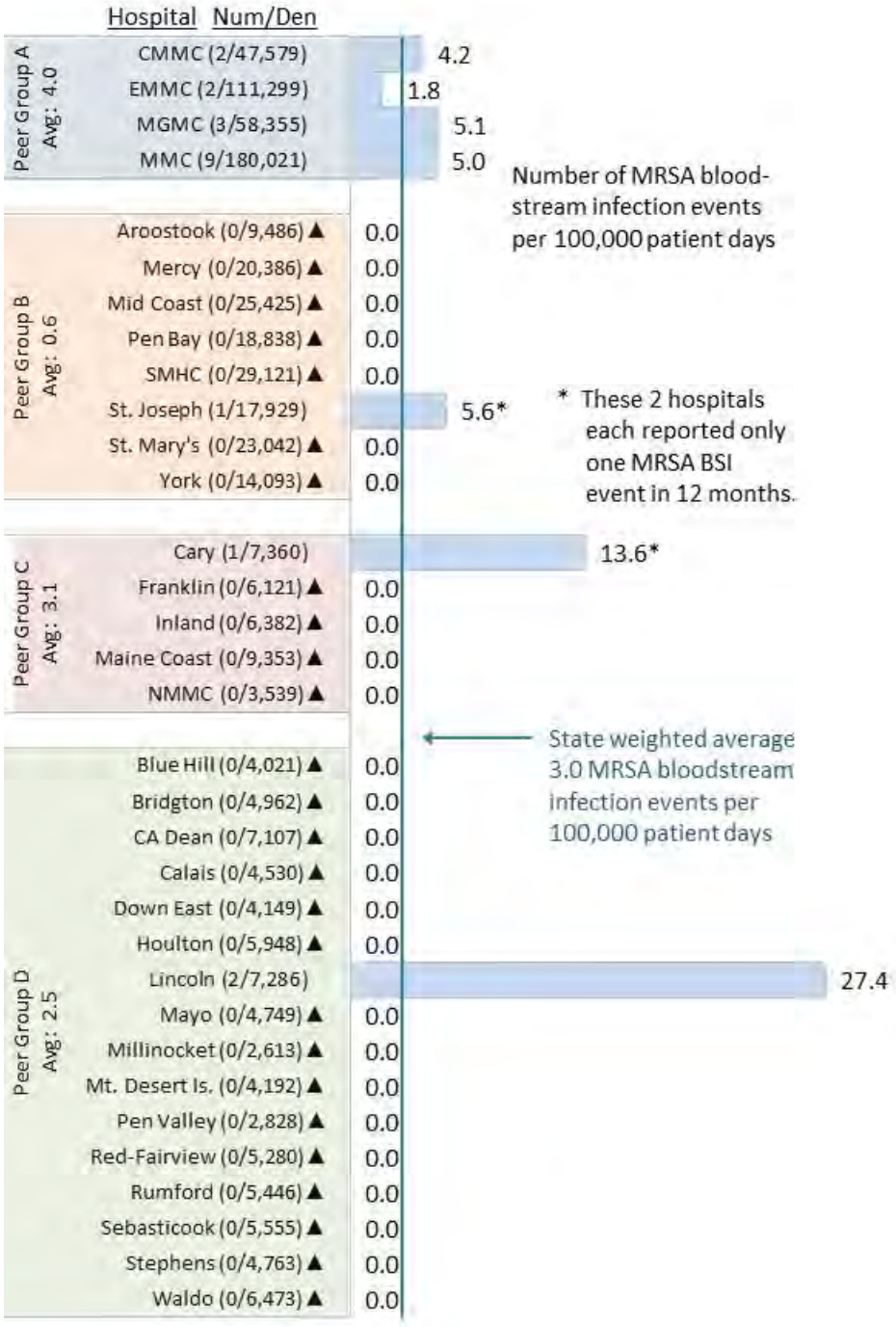


▲ A hospital whose bloodstream event rate was statistically significantly better than the statewide average

‡ "Hospital-onset" means MRSA was not identified until on-or-after the 4th day after hospital admission.

MRSA: This chart displays Maine's facility-wide hospital onset (HO) ‡ methicillin-resistant *Staphylococcus aureus* bloodstream Infection (MRSA BSI) LabID event rates per 100,000 patient days during the 2017 reporting period. During those 12 months, Maine hospitals reported 20 HO MRSA BSI events, 26 of 33 Maine hospitals reported zero events, and two hospitals reported having only one. The hospitals are arranged by peer groups.

Chart 11b: Number of MRSA HO bloodstream infection events per 100,000 patient days, July 2016 - June 2017 *Lower bloodstream event rates are better*

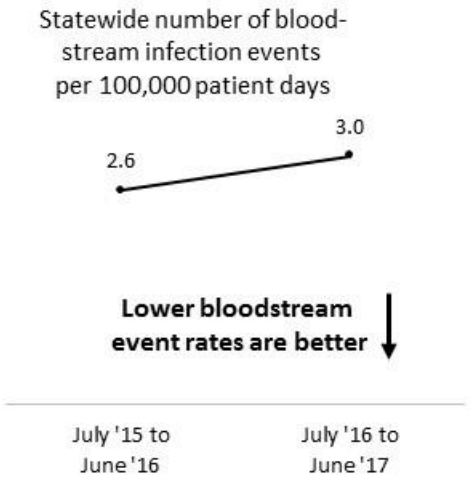


▲ A hospital whose bloodstream event rate was statistically significantly better than the statewide average

‡ "Hospital-onset" means MRSA was not identified until on-or-after the 4th day after hospital admission.

MRSA trends: This chart displays the two-year trend in Maine's facility-wide hospital onset[44] (HO) methicillin-resistant *Staphylococcus aureus* bloodstream Infection (MRSA BSI) event rate per 100,000 patient days between the 2016 and 2017 reporting periods. Maine hospitals reported 17 MRSA BSI events during the 2016 reporting period and 20 MRSA BSI events in the following reporting period, while the rate rose from 2.6 events per 100,000 patient days to 3.0 events. However, the difference in rates was not statistically significant.

Chart 12: Two-year trend in the number of Maine's statewide hospital-onset MRSA bloodstream infections per 100,000 patient days



[44] "Hospital-onset" means MRSA was not identified until on-or-after the 4th day after hospital admission.

Clostridium difficile

The once easy-to-treat *Clostridium difficile ("C. difficile")* bacteria that causes diarrhea, fever, loss of appetite, nausea, belly pain and tenderness have now become more virulent, and sometimes fatal. Between 1997 and 2004, the death rate from *C. difficile* infections rose from 1.5% to 6.9%.[45] The U.S. had an estimated 453,000 *C. difficile* infections in 2011, of which nearly two-thirds were healthcare-associated and nearly one-quarter were identified as hospital-onset infections.[46]

Most cases occur in people on antibiotics; therefore, people already sick, those recovering from surgery and the elderly are at increased risk. *C. difficile* spores live for a very long time and are resistant to most disinfectants. They can be found on everyday items like bed linens and medical equipment, and transported on the hands of doctors, nurses, other care givers, visitors or others. This is why it is important to remind care givers and medical providers to wash their hands between seeing patients. However, it is also important to note that *C. difficile* infections are possible even when antibiotic use is appropriate and all of the infection prevention standards are met.

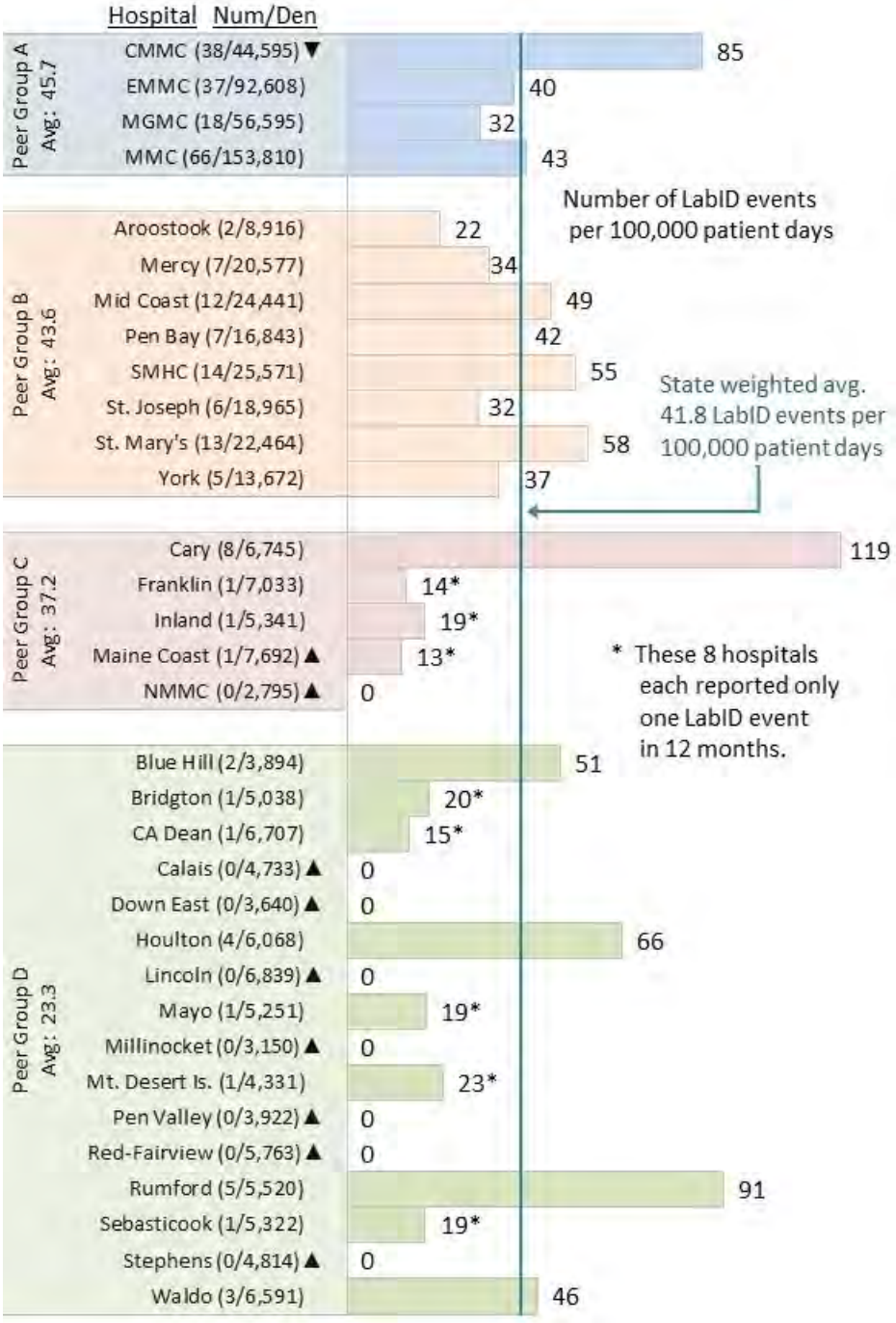
The *C. difficile* rates presented in this report are based on hospital onset (HO) LabID events (i.e., cases where a patient lab sample tested positive for the presence of *C. difficile* bacteria). While the LabID method is recognized by the federal CDC as a reasonably reliable proxy for *C. difficile* infection rates, it is important to understand that while the LabID method detects the presence of *C. difficile* bacteria in or on a patient's body, a patient can carry the bacteria without having an infection. Therefore, the number of *C. difficile* LabID events is very likely to be greater than the number of actual *C. difficile* infections. However, MQF and the Maine CDC agreed to allow hospitals to report LabID event data instead of numbers of actual infections, because it greatly reduces the data collection burden. The *C. difficile* LabID event rates appearing in this report reflect the data as it was reported by each hospital to the NHSN.

[45] Ghose, Chandrabali, *Clostridium difficile* infection in the twenty-first century, Emerging Microbes and Infections, vol. 2, p. 9, Sept. 2013. Accessed online on Feb. 4, 2015 at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3820989/

[46] Lessa, Fernanda C., et.al., *Burden of* Clostridium difficile *Infection in the United States*, The New England Journal of Medicine, 372:825-834, Feb. 26, 2015.

***C. difficile*:** This chart displays Maine's facility-wide hospital onset (HO)‡ *Clostridium difficile* (*C. difficile*) LabID event rates per 100,000 patient days for the 2016 data reporting period. During those 12 months, Maine hospitals reported 255 HO *C. difficile* LabID events. Eight of 33 Maine hospitals reported zero events, and another 8 hospitals reported having only one. The hospitals are arranged by peer groups.

Chart 11a: Number of *C. difficile* HO LabID events per 100,000 patient days, July 2015 – June 2016 *Lower LabID event rates are better*



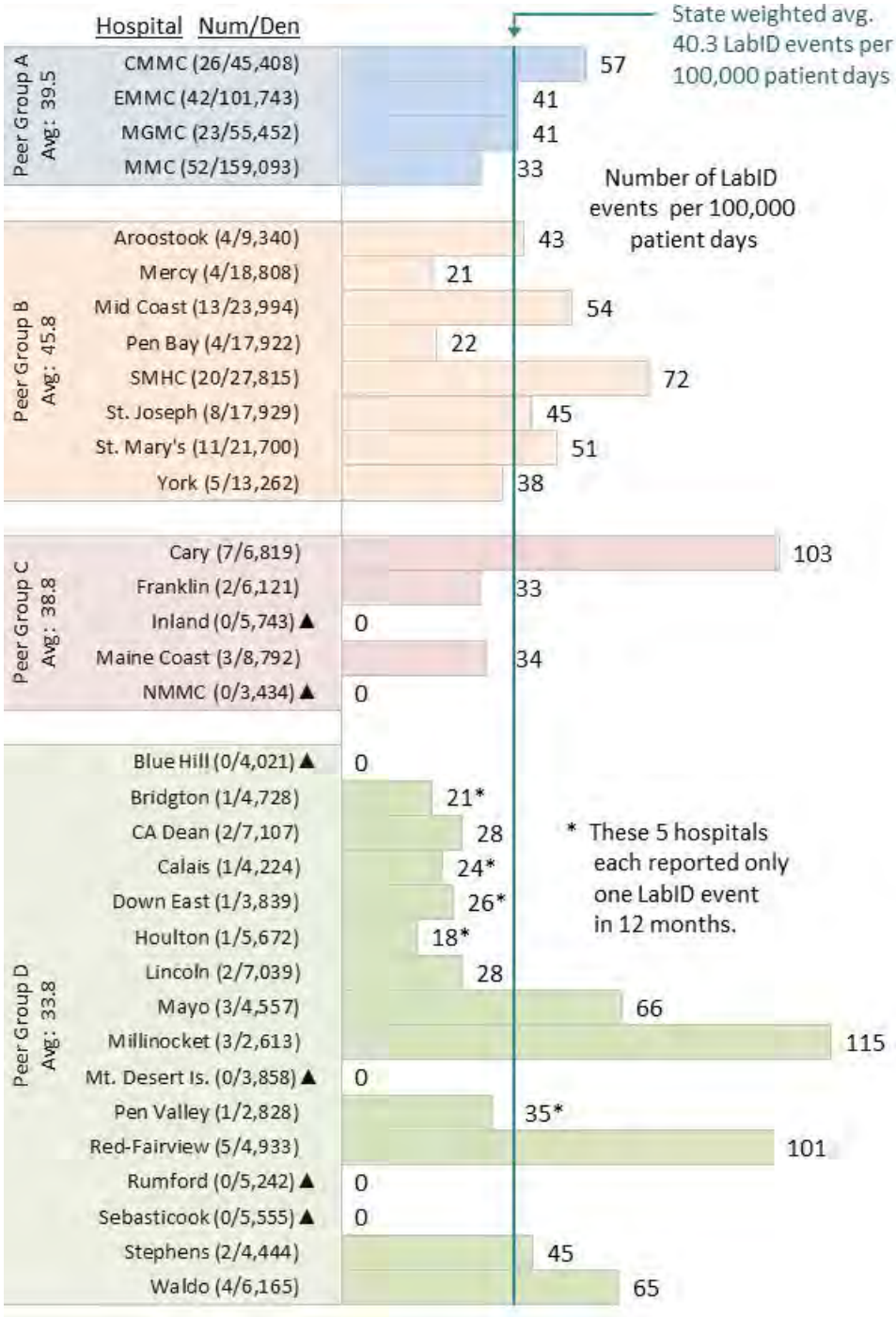
▲ A hospital whose LabID event rate was statistically significantly better than the statewide average

▼ A hospital whose LabID event rate was statistically significantly worse than the statewide average

‡ "Hospital-onset" means *C. difficile* was not identified until on-or-after the 4th day after hospital admission.

***C. difficile*:** This chart displays Maine's facility-wide hospital onset (HO)‡ *Clostridium difficile* (*C. difficile*) LabID event rates per 100,000 patient days for the 2017 data reporting period. During those 12 months, Maine hospitals reported 250 *C. difficile* HO LabID events. Six of 33 Maine hospitals reported zero events, and another 5 hospitals reported having only one. The hospitals are arranged by peer groups.

Chart 11b: Number of *C. difficile* HO LabID events per 100,000 patient days, July 2016 – June 2017 *Lower LabID event rates are better*

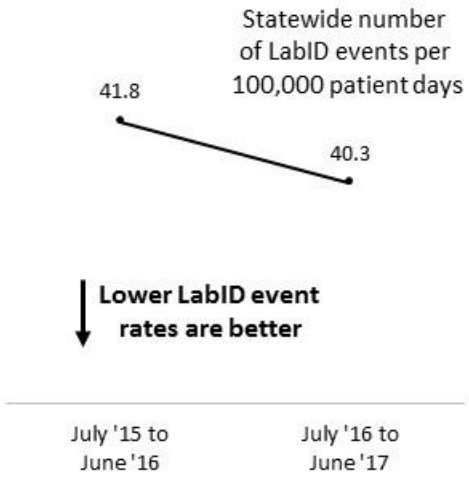


▲ A hospital whose LabID event rate was statistically significantly better than the statewide average

‡ "Hospital-onset" means *C. difficile* was not identified until on-or-after the 4th day after hospital admission.

***C.difficile* trend:** This chart displays the change in the statewide number of *Clostridium difficile ("C. difficile")* hospital onset[47] (HO) LabID event s[48] per 100,000 patient days between the 2016 and 2017 reporting periods. Maine hospitals reported 255 HO LabID events during the 2016 reporting period and 250 events in the following one. Between the two reporting periods, the rate fell slightly from 41.8 HO LabID events per 100,000 patient days to 40.3 per 100,000 patient days. Maine hospitals would have had about 9 additional *C. difficile* LabID events during the 2017 reporting period had the rate not improved. However, the difference in rates between the two reporting periods was not statistically significant.

Chart 12: Two-year trend of Maine facility-wide *C. difficile* LabID events per 100,000 patient days



[47] "Hospital-onset" means *C. difficile* was not identified until on-or-after the 4th day after hospital admission.

[48] A LabID event means that *C. difficile* bacteria were found in a patient sample. However, some patients can have the bacteria in their sample even though they have not been infected and made ill by it.

Appendix C: Outcomes and process measures

1. Summary of Maine Hospital Outcomes Measures in SFY 2016 and SFY 2017

The following table summarizes hospital-onset infection or LabID event rates for four outcomes measures presented in Appendix B. For all four measures, lower rates are better. A score is marked by a "▲" if it was statistically significantly better than the statewide average, or marked with a "▼" for statistically significantly worse. "n/a" indicates the hospital had zero patient days for that measure. (See "statistical significance" in Appendix J)

Table 2: Maine hospital outcomes measures for the 2016 and 2017 reporting periods

Peer Group	Hospital	Number of infections per: 1,000 central line days				Number of HO LabID events per 100,000 patient days			
		HAI-1 CLABSI		HAI-2 Neonatal ICU		MRSA BSI events		*C. difficile* LabID events	
		2016	2017	2016	2017	2016	2017	2016	2017
A	CMMC	0.4	1.3	0.0	0.0	4.3	4.2	85▼	57
	EMMC	0.5	1.0	0.9	2.0	4.9	1.8	40	41
	MGMC	0.2	0.7	*n/a*	*n/a*	1.7	5.1	32	41
	MMC	0.7	1.0	0.6	0.0	2.9	5.0	43	33
B	Aroostook	0.0▲	1.6	*n/a*	*n/a*	0.0▲	0.0▲	22	43
	Mercy	1.5	0.4	*n/a*	*n/a*	0.0▲	0.0▲	34	21
	Mid Coast	0.7	0.5	*n/a*	*n/a*	0.0▲	0.0▲	49	54
	Pen Bay	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	42	22
	SMHC	2.1	0.4	*n/a*	*n/a*	3.7	0.0▲	55	72
	St. Joseph	0.7	2.3	*n/a*	*n/a*	0.0▲	5.6	32	45
	St. Mary's	0.7	0.0▲	*n/a*	*n/a*	4.2	0.0▲	58	51
	York	2.1	1.5	*n/a*	*n/a*	7.0	0.0▲	37	38
C	Cary	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	13.6	119	103
	Franklin	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	14	33
	Inland	0.0▲	0.0▲	*n/a*	*n/a*	16.4	0.0▲	19	0▲
	Maine Coast	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	13▲	34
	NMMC	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	0▲
D	Blue Hill	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	51	0▲
	Bridgton	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	20	21
	CA Dean	0.0▲	n/a	*n/a*	*n/a*	0.0▲	0.0▲	15	28
	Calais	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	24
	Down East	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	26
	Houlton	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	66	18
	Lincoln	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	27.4	0▲	28
	Mayo	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	19	66
	Millinocket	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	115
	Mt. Desert Is.	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	23	0▲
	Pen Valley	0.0▲	9.0	*n/a*	*n/a*	0.0▲	0.0▲	0▲	35
	Red-Fairview	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	101
	Rumford	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	91	0▲
	Sebasticook	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	19	0▲
	Stephens	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	0▲	45
	Waldo	0.0▲	0.0▲	*n/a*	*n/a*	0.0▲	0.0▲	46	65
Statewide weighted average		0.6	0.9	0.7	0.8	2.58	2.99	41.8	40.3

2. Summary of Maine Hospital Compliance Rates for Process Measures, July 2015 to June 2017

The following table summarizes each hospital's rate of documented compliance with three sets, or "bundles", of best practices for preventing infections and other complications related to the use of central-line catheters or mechanical ventilators (breathing machines). For all three measures, higher rates of compliance are better. A score is marked by a "▲" if it was statistically significantly better than the statewide average, or marked with a "▼" for statistically significantly worse. "n/a" indicates the hospital had zero patient days for that measure. (See "statistical significance" in Appendix J)

Table 3: Hospital compliance with infection prevention best practices in the 2016 and 2017 reporting periods

Peer Group	Hospital	HAI-3: Central-line ICU bundle		HAI-4: Central-line insertion bundle		HAI-5: Ventilator bundle	
		2016	2017	2016	2017	2016	2017
A	CMMC	98.4%▲	85.8%▼	100.0%▲	100.0%▲	98.7%▲	96.2%
	EMMC	99.7%▲	89.6%	100.0%▲	80.0%	100.0%▲	99.7%▲
	MGMC	100.0%▲	100.0%▲	93.3%	71.4%	100.0%▲	100.0%▲
	MMC	82.1%▼	83.3%▼	88.9%▼	87.2%▼	87.2%▼	88.9%▼
B	Aroostook	97.8%	97.7%▲	100.0%▲	100.0%▲	100.0%▲	100.0%▲
	Mercy	78.9%▼	75.0%	97.6%	97.4%	93.5%	94.4%
	Mid Coast	100.0%▲	100.0%▲	*n/a*	n/a	42.9%▼	100.0%▲
	Pen Bay	63.0%▼	75.9%	100.0%▲	50.0% †	100.0%▲	95.7%
	SMHC	100.0%▲	96.2%▲	100.0%▲	n/a	100.0%▲	98.3%▲
	St. Joseph	100.0%▲	100.0%▲	*n/a*	n/a	100.0%▲	100.0%▲
	St. Mary's	100.0%▲	100.0%▲	*n/a*	n/a	100.0%▲	100.0%▲
	York	100.0%▲	100.0%▲	100.0%▲	100.0%▲	96.2%	76.9%▼
C	Cary	100.0%▲	100.0%▲	100.0%▲	100.0%▲	100.0%▲	100.0%▲
	Franklin	94.4%	91.7%	*n/a*	100.0%▲	100.0%▲	100.0%▲
	Inland	100.0%▲	100.0%▲	95.7%	100.0%▲	100.0%▲	100.0%▲
	Maine Coast	90.0%	82.9%	80.0%	100.0%▲	96.3%	100.0%▲
	NMMC	100.0%▲	100.0%▲	100.0%▲	100.0%▲	83.3%	0.0%†▼
D	Blue Hill	*n/a*	n/a	*n/a*	n/a	*n/a*	*n/a*
	Bridgton	100.0%▲	100.0%▲	100.0%▲	100.0%▲	*n/a*	*n/a*
	CA Dean	*n/a*	n/a	*n/a*	n/a	*n/a*	*n/a*
	Calais	100.0%▲	100.0%▲	100.0%▲	100.0%▲	*n/a*	*n/a*
	Down East	100.0%▲	87.5%	*n/a*	n/a	*n/a*	*n/a*
	Houlton	100.0%▲	100.0%▲	100.0%▲	100.0%▲	*n/a*	100.0%▲
	Lincoln	100.0%▲	100.0%▲	100.0%▲	n/a	100.0%▲	*n/a*
	Mayo	*n/a*	n/a	*n/a*	100.0%▲	*n/a*	*n/a*
	Millinocket	87.5%	78.6%	100.0%▲	n/a	100.0%▲	100.0%▲
	Mt. Desert Is.	100.0%▲	100.0%▲	100.0%▲	n/a	100.0%▲	*n/a*
	Pen Valley	91.7%	100.0%▲	50.0% †	n/a	*n/a*	*n/a*
	Red-Fairview	100.0%▲	85.7%	100.0%▲	100.0%▲	100.0%▲	100.0%▲
	Rumford	100.0%▲	n/a	100.0%▲	100.0%▲	*n/a*	*n/a*
	Sebasticook	100.0%▲	71.4%	100.0%▲	100.0%▲	*n/a*	50.0% †
	Stephens	100.0%▲	100.0%▲	100.0%▲	100.0%▲	87.5%	100.0%▲
	Waldo	82.4%	100.0%▲	100.0%▲	100.0%▲	100.0%▲	100.0%▲
Statewide weighted average		93.4%	90.5%	96.0%	92.0%	92.1%	94.3%

"*n/a*" This hospital reported having no cases belonging to the measure.
† This rate looks low, but the hospital reported the measure applied to only two cases that year.

List of the Maine Chapter 270 quality indicators included in Appendix C: Outcomes and Process Measures

Summary of Maine Hospital Outcomes Measures

HAI-1	Central line catheter-associated blood stream infection rate for intensive care unit patients, per 1,000 central line days
HAI-2	Number of catheter-related blood stream infections among neonatal intensive care unit patients per 1,000 central line catheter or umbilical days
MRSA	Number of hospital onset associated Methicillin-resistant *Staphylococcus aureus* LabID events per 100,000 inpatient days
C. difficile	Number of hospital onset associated *Clostridium difficile* LabID events per 100,000 inpatient days

Summary of Maine Hospital Process Measures

HAI-3	Percent documented compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care units
HAI-4	Percent documented compliance with the four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas
HAI-5	Percent documented compliance with all five evidence-based interventions for patients with mechanical ventilation (ventilator bundle compliance) in intensive care units

Appendix D: 2017-2018 **Annual Report of the Maine CDC's** HAI/AR Program

The Maine Center for Disease Control and Prevention (CDC) is home to a small, but active program working with healthcare facilities and key stakeholders across the state to reduce and prevent healthcare associated infections (HAI) and antibiotic resistance (AR). The Healthcare Associated Infections/Antibiotic Resistance (HAI/AR) Program:

- **Unites healthcare, public health, and the public in the common goal of reducing and preventing healthcare-associated and antibiotic-resistant infections.**

  HAI/AR Collaborating Partners: A state advisory group composed of membership from healthcare, public health, and the public. This group meets quarterly to make recommendations on state strategies for the reduction of healthcare associated and antibiotic-resistant infections across all healthcare settings. Leaders from the HAI/AR Program and the Maine Quality Forum co-chair this committee.

- **Collaborates with public health, healthcare, and academic partners to develop, refine and implement HAI prevention and antibiotic stewardship strategies.**

  - Antimicrobial/Antimicrobial Stewardship (AS) Programs: Consists of core elements that when operationalized have been effective in reducing inappropriate antibiotic use that can contribute to antibiotic resistance. The HAI/AR Program is a resource to healthcare systems and facilities working to implement AMS Programs. Education sessions were held periodically across the state to discuss the U.S. CDC's *Core Elements of Antibiotic Stewardship Programs* and promote the importance of antibiotic stewardship in acute care, outpatient and nursing home settings. The number of facilities meeting all of the federal CDC's core elements continues to grow each year.

  - The Targeted Assessment for Prevention (TAP) Strategy: A federal CDC HAI reduction strategy utilized by the HAI/AR Program in working with acute care hospitals with high rates of Central Line Associated Blood Stream Infections (CLABSI), Catheter-Associated Urinary Tract Infections (CAUTI), and *Clostridium difficile* infections (CDI). The HAI/AR Program reaches out to facilities with high rates, conducts a review of the facility HAI data, and promotes the use of a targeted assessment to identify gaps in evidence-based practices. A summary report of identified gaps along with recommendations on mitigation strategies is provided to participating facilities.

  - *Clostridium difficile* Infections (CDI) Collaborative: A collaboration of the Maine CDC HAI/AR Program, Healthcentric Advisors Quality Improvement Network - Quality Improvement Organization (QIN-QIO), and the Maine Hospital Association Health Research and Educational Trust - Health Improvement Innovation Network (HRET-HIIN). The purpose of the collaboration is to reduce CDI by bringing together acute care hospitals with higher rates and their surrounding nursing homes to work together to prevent transmission of these

infections. The HAI/AR Program staff provided training on CDI prevention and assessing facility CDI data to measure the success of prevention activities.

- **Tailors national HAI prevention guidelines and strategies to Maine.**

    - Highly Infectious Disease Readiness: The Ebola outbreak in 2015 prompted the realization in the United States that hospitals need to be able to meet a new level of infectious disease readiness. The HAI/AR Program, in collaboration with public health programs for Emergency Preparedness, Infectious Disease, Licensing and Regulatory Services, and the State Public Health Laboratory worked with three hospitals in Maine to achieve the status of "Assessment Hospital". All three hospitals successfully completed readiness activities in 11 domains of preparedness. Assessment hospitals will receive, assess, and monitor a person under investigation for a highly infectious disease. If a diagnosis of a highly infectious disease cannot be ruled out, the Assessment Hospital will work with local, state, and out-of-state emergency transport teams to transfer the patient to a specially designated "Treatment Hospital". While the threat from the Ebola outbreak has declined, maintaining this new level of readiness is essential as the threat of such an outbreak is possible in the future.

    - Containment of Novel or Targeted Multidrug-Resistant Organisms (MDROs): A new effort by federal CDC to slow the spread of organisms that are highly resistant to antibiotics or have the ability to share resistance genes directly with other bacteria. The State Public Health Laboratory offers specialized testing for genetic markers that aid in the identification of these organisms. The HAI/AR Program conducts monitoring to determine if these organisms are in Maine and works with healthcare facilities throughout the state to prevent the spread of these organisms when a patient or resident is admitted for an overnight stay in a healthcare facility.

    - Standardizing HAI/AR Surveillance in Maine's Psychiatric Hospitals: The HAI/AR Program hosted several meetings last year to bring together Infection Preventionists from Maine's Psychiatric Hospitals to develop a standardized approach for monitoring infections and antibiotic-resistant organism in their facilities. A standardized process for monitoring will make it easier for facilities to identify infection or antibiotic-resistant patterns and trends in order to take appropriate action if rates are increasing.

- **Detects and responds to HAI and AR threats in Maine, provides technical expertise for outbreak response and conducts infection control assessments to identify areas for improvement.**

    - State Surveillance and Outbreak Reporting: The Rules for the Control of Notifiable Diseases and Conditions (10-144 Chapter 258) require that the state conduct surveillance for infectious diseases, new or unusual organisms, select MDROs, and outbreaks. The HAI/AR Program and Infectious Disease staff conduct case reviews and epidemiologic investigations on reported cases. Should an outbreak be reported in a healthcare facility, the Maine CDC works with the healthcare facilities to determine if the outbreak has a common source and

provides assistance with outbreak response activities. HAI and AR data reported to state and/or federal databases is also utilized to conduct state surveillance and detect HAI or AR outbreaks.

- The Infection Control Assessment and Response (ICAR) Strategy: A federal CDC HAI reduction strategy utilized by the HAI/AR Program to drive prevention activities. The HAI/AR Program uses a variety of HAI or AR related data to select healthcare facilities in Maine for ICAR consultative visits. This consultation includes a one-day on-site assessment of Infection Prevention and Control activities, in an educational, problem solving setting. A summary report of identified gaps along with recommendations on mitigation strategies is provided to facilities. Positive feedback shared state-wide from the first facilities selected for this activity has prompted numerous requests from other facilities who are now asking to participate in ICAR assessments on a voluntary basis.

- **Analyzes HAI and AR data to identify state, regional, or local patterns and trends to drive prevention and reduction activities; conducts validation activities to ensure reported data is accurate**

  - Chief Executive Officer (CEO) Dashboard Reports: These are compiled annually for acute care hospital CEOs as a communication tool between the facility's Infection Prevention and Control department and hospital leadership. The facility's data from state and federal surveillance are summarized, making note of high rates, and providing resources to evidence-based mitigation strategies. Each facility report is shared with that facility's CEO and Infection Preventionist(s).

  - Validation of Data: HAI data are available for public reporting through Medicare 'Compare' websites, the State HAI Annual Report and federal CDC HAI Progress Reports. These data are also utilized by facilities and key stakeholders in Maine to target improvement efforts and measure progress. Therefore, it is important that these data are accurate. The HAI/AR Program continues to conduct a variety of data quality checks on HAI data submitted to the National Healthcare Safety Network (NHSN), a federal database used for reporting for both federal and state mandated HAI data. The HAI/AR Program staff also provides a large volume of technical assistance for healthcare facilities using NHSN.

  - The Resistome Study: Whole Genome Sequencing is a modern technology used to determine the complete deoxyribonucleic acid (DNA) structure of a microorganism. The HAI/AR Program collaborated with the State Public Health Laboratory and Maine hospitals to collect 400 multidrug-resistant organism specimens from across the state for WGS analysis. The information gained from this in-depth study will help us identify MDROs present in Maine and will allow us to target AR prevention activities.

- **Serves as a central resource for credible, up-to-date, evidence-based information for HAI and AR awareness, prevention, and outbreak response**

- Maine Infection Prevention Forum: The HAI/AR Program collaborates with the Maine Quality Forum and the Muskie School of Public Health to address a state-wide need for education and training of new Infection Preventionists working in the long-term care setting. The Maine Infection Prevention Forum is a free web-based training platform that allows new Infection Preventionist and Nursing Home staff to receive training on a wide-variety of Infection Prevention and Control topics. Over 108 facilities and 213 individuals have utilized this training. Modules on Biological Hazards and Bloodborne Pathogens have been added in the last year. The HAI/AR Program serves as a subject matter expert in the development and updating of this information.

- Investigations and Consults: The HAI/AR Program continues to provide assistance to healthcare facilities to investigate patterns and trends in data, control outbreaks, and provide free consultations on a wide variety of infection prevention and control matters across the state.

- Education/Training: Numerous education and training sessions were held across the state in 2017-2018. Topics included:
    - Seasonal Influenza
    - Multidrug-Resistant Organism Management in Long-term Care
    - Using the National Healthcare Safety Network
    - Surgical Site Infection Risk Factors
    - Competency-Based Training
    - Transparent Communication Strategy
    - Infection Prevention and Control & Antibiotic Resistance in Long-term Care
    - HAI Outbreak Reporting
    - Emerging Pathogens
    - Colistin Resistance
    - Carbapenem-resistant *Enterobacteriaceae*
    - *Candida auris*
    - Containment of Novel and Targeted Multidrug-Resistant Organisms
    - State and Regional Public Health Laboratory Network and Activities
    - Antimicrobial Stewardship Programs
    - Multidisciplinary Communication for Antimicrobial Stewardship

State of Maine Healthcare-Associated Infections Plan 2015-2018

Maine Center for Disease Control and Prevention
An Office of the Department of Health and Human Services

Paul R. LePage, Governor
Mary C. Mayhew, Commissioner

Department of Health and Human Services
Maine Center for Disease Control and Prevention

Introduction:

Healthcare-Associated infections (HAIs) are infections caused by a wide variety of common and unusual bacteria, fungi and viruses during the course of receiving medical care. Medical advances have brought lifesaving care to patients, yet many of those advances come with a risk of acquiring an HAI. These infections related to medical care can be devastating and even deadly.

On any given day, about one in 25 hospital patients have at least one HAI. There were an estimated 722,000 HAIs in United States acute care hospitals in 2011. About 75,000 hospital patients with HAIs died during their hospitalization.[49] As our ability to prevent HAIs grows, these infections are increasingly unacceptable.

Treatment for HAIs and other infections is becoming more challenging as antibiotic resistance increases. Several bacteria have gained the ability to generate enzymes that destroy antibiotics or can change their cell wall structure to block antibiotics. In these cases, antibiotic choices for treatment are becoming increasingly limited, expensive and in some cases, nonexistent.

Each year in the United States, at least 2 million people have an infection associated with bacteria that are resistant to antibiotics, and at least 23,000 people die each year because of these infections[2]. Antibiotic-resistant infections can happen anywhere. Data show that most happen in the community; however, most deaths related to antibiotic resistance happen in inpatient healthcare settings, such as hospitals and nursing homes. Antibiotic resistance is one of the most pressing threats facing the world today.[50]

The road to eliminating HAIs and combating antibiotic resistance is a road traveled by many. National leadership is issuing guidance in the form of action plans. Goals are established and annual reports monitor progress.

- Action plans:
  - *National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination.* April 2013. (U.S. Department of Health and Human Services)
  - *National Action Plan for Combating Antibiotic Resistant Bacteria*. March 2015. (U.S. Government)
- Goals: *Healthy People 2020.* December 2010. (CDC)
- Progress Reports: *HAI Progress Report.* Annual Report. (CDC)

The State of Maine has an important role in this national movement. Numerous organizations across the state as well as healthcare facilities in acute care, extended care, and ambulatory care settings are working hard to eliminate HAIs and combat antibiotic resistance. Maine's HAI Plan is our State's action plan for this work over the next three years. This plan has three key areas of focus:

- Responding to threats of infectious disease transmission
- Analyzing data to target prevention activities
- Preventing future HAIs and antibiotic resistance through education and training, promoting best practices through group collaborative programs and expanding antimicrobial stewardship.

The Maine CDC developed this plan in consultation with the HAI/AR Collaborating Partners advisory council, a group jointly convened by the Maine CDC and Maine Quality Forum (MQF) and composed of a broad range of stakeholders listed in Appendix F. The MQF will include an annual summary of the plan's activities and outcomes in Maine's State HAI Report.

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[49] Magill SS, Edwards JR, Bamberg W, et al. *Multistate Point-Prevalence Survey of Health Care–Associated Infections*. *N Engl J Med* 2014;370:1198-208.

[50] Centers for Disease Control and Prevention. Antibiotic/Antimicrobial Resistance website.: http://www.cdc.gov/drugresistance.

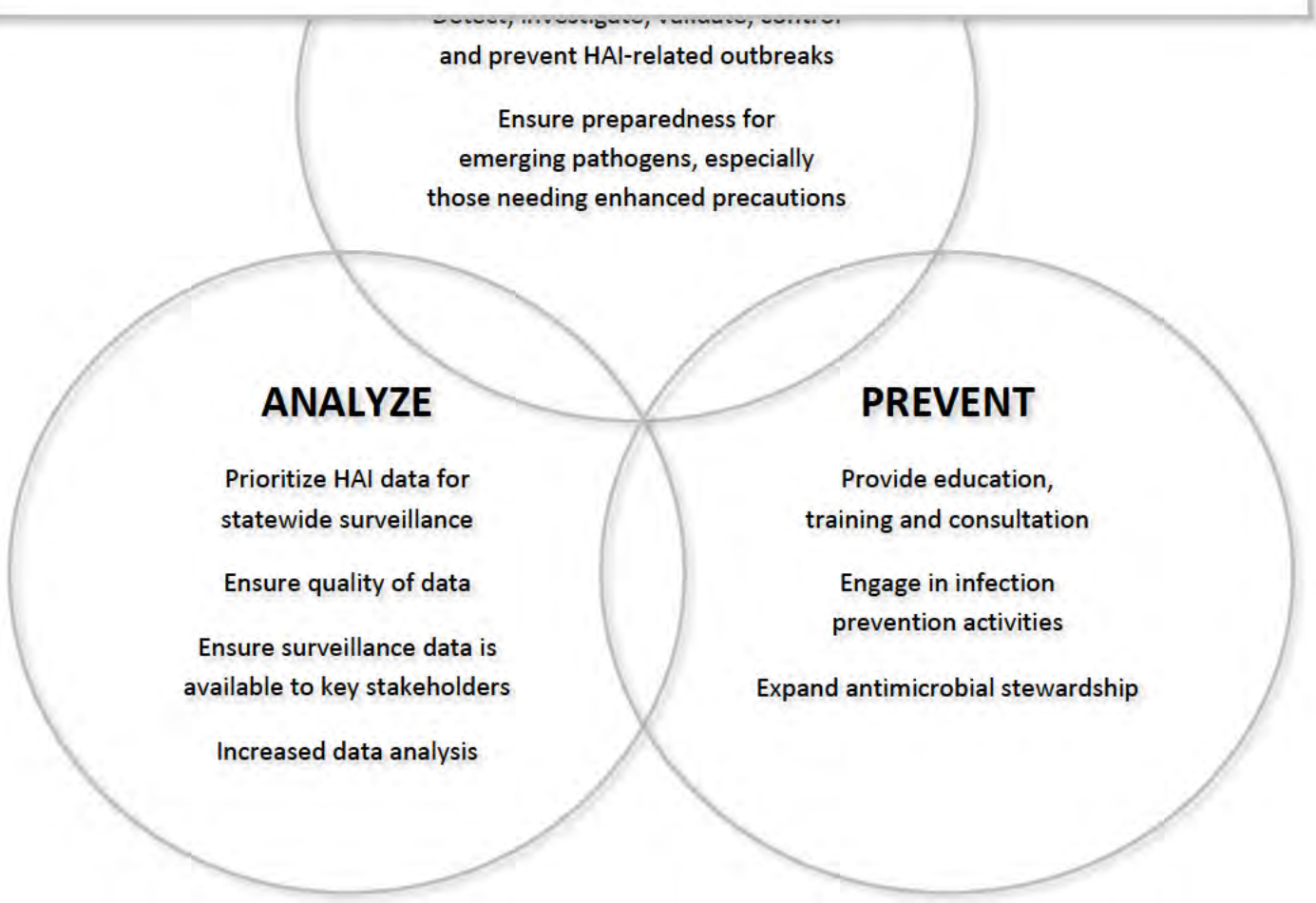
Acronyms

AR	Antibiotic Resistance
CAUTI	Catheter-Associated Urinary Tract Infection
CDC	federal Centers for Disease Control and Prevention
CDI	*Clostridium difficile* Infection
CEO	Chief Executive Officer
CLABSI	Central Line-Associated Blood Stream Infection
CRE	Carbapenem-Resistant *Enterobacteriaceae*
DART	Data Analysis by Region for Trends Program
DHHS	Department of Health and Human Services
DNA	Deoxyribonucleic acid
HAI	Healthcare Associated Infection
HETL	Health and Environmental Testing Laboratory
ICAP	Infection Control Assessment and Promotion Program
Maine CDC	Maine Center for Disease Control & Prevention
MDRO	Multidrug-Resistant Organism
MHA	Maine Hospital Association
MHDO	Maine Health Data Organization
MICIS	Maine Independent Clinical Information Service
MQF	Maine Quality Forum
MRSA	Methicillin-Resistant *Staphylococcus aureus*
NHSN	National Healthcare Safety Network
PTC-APIC	Pine Tree Chapter – Association for Professionals in Infection Control and Epidemiology
QIN-QIO	Quality Innovation Network – Quality Improvement Organization
VAE	Ventilator-Associated Event
VISA	Vancomycin-Intermediate resistant *Staphylococcus aureus*
VRE	Vancomycin-Resistant *Enterococcus*

GOAL

Maine will work to eliminate healthcare-associated infections and combat antibiotic resistance by collaborating with stakeholders across the healthcare continuum and the public to focus on three key actions:

Respond, Analyze, and Prevent.



RESPOND				
Priorities	**2015**	**2016**	**2017**	**2018**
Detect, investigate, validate, control and prevent HAI-related outbreaks	Define HAI outbreak for State of Maine, based on federal CDC epidemiological definitions. Design and implement a system to track HAI outbreak response and outcomes, for outbreaks reported to public health.	Assess capacities of healthcare facilities to detect, report and respond to potential outbreaks and emerging threats using standardized tool from federal CDC. Determine gaps in HAI outbreak reporting and response in all healthcare settings	Address gaps in outbreak investigation capacity by working with healthcare partners to develop a plan and infrastructure to improve outbreak reporting and response.	Explore public reporting of outbreak data, the need for validation of outbreak data prior to public reporting and which outbreaks are appropriate of public reporting, in real-time.
		Explore the need for additional laws related to State authority for public health to conduct investigations related to HAI outbreaks and lapses in infection prevention and control.	Explore communication plans among healthcare facilities to minimize the risk of transmission of infectious disease and/or outbreak.	
Ensure preparedness for emerging pathogens, especially those needing enhanced precautions	Assess Ebola readiness at all four Ebola-assessment hospitals in the state. DHHS to work collaboratively with these selected healthcare facilities to address any remaining gaps in readiness in order to achieve "capacity met" status in each of 11 domains of preparedness. Conduct webinar with all hospitals to share findings.	Explore state level emerging pathogen drill and/or table top exercise at HAI conference.		
	CRE should become a 'Notifiable Conditions' by the fall of 2015. All cases of CRE would be reportable to Maine CDC for epidemiologic study.	Analyze initial data from CRE as a Notifiable Condition in the state. Based on first year findings, determine the need for additional guidance for control of CRE beyond the federal CDC 2012 CRE Toolkit. Investigate having local labs send CRE specimens to HETL to store, in case funds for PCR become available in the future.	Include CRE data in the Maine CDC's *Reportable Infectious Diseases in Maine* annual summary report (include genotypic data).	

ANALYZE				
Priorities	**2015**	**2016**	**2017**	**2018**
Prioritize HAI data for statewide surveillance	Update HAI reporting requirements (Chapter 270) to bring it into alignment with state and federal HAI changes.	Review and revise state mandated HAI reporting requirements (Chapter 270).		
		Explore surveillance for LTC facilities, targeting MDROs, antibiotic usage, use of MHDO vs. NHSN for reporting.		
Ensure quality of HAI data	Conduct validation for NHSN reportable data on a rotating schedule, as needed.			
Ensure surveillance data is available to key stakeholders	Legislature and Public: State HAI Annual Report issued by MHDO/MQF.			
	Public: Comparisons of acute care hospital cost, patient satisfaction and HAI data provided through Compare Maine			
	Healthcare Facilities: Facility and region (six New England states) reports for facilities in QIN-QIO collaborative programs.			
	Acute Care: CEO Dashboard Reports issued annually by Maine CDC; facility specific trend of HAI and prevention data. *(to be expanded to other facilities types as they come on board with HAI reporting)*			
	The Maine Hospital Association (MHA) Board of Directors: Regularly reviewing hospital specific and statewide C. difficile and MRSA data obtained from the Maine CDC/MHDO.			
Increase data analysis	Develop and implement the Data Analysis by Region for Trends (DART) Program. • Create an inventory of all healthcare settings in the state. Include at least one infection control point of contact at each facility; identify current regulatory/licensing authority for each healthcare facility; explore obtaining infection control related regulatory survey findings. • Build capacity to analyze data reported by facilities in a defined region to allow for comprehensive assessment of potential HAI threat, and communicate results with healthcare facilities • Work with federal CDC to guide analytic direction and identify facilities for prioritized assessment/response.			

<table>
<tr><th colspan="5">PREVENT</th></tr>
<tr><th>Priorities</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th></tr>
<tr><td rowspan="4">Provide education, training and consultation</td><td>Acute Care: Education webinars targeting CLABSI, CAUTI, CDI, VAE prevention (QIN-QIO).
Acute Care: Ebola preparedness training (federal CDC)</td><td>Build resource list or library of various educational tools, presentations, etc. that have been created. Share repository with healthcare facilities in state.</td><td>Promote patient education ‘What you can do to help prevent infection’. Explore media sources such as public service announcements, Facebook, Twitter, radio spots, newspapers, and websites.</td><td></td></tr>
<tr><td colspan="4">Offer Infection Preventionist mentorship program (PTC-APIC)</td></tr>
<tr><td></td><td colspan="2">Explore logistics of holding a bi-annual HAI prevention conference in 2016 or 2017. Explore partnership to host conference with APIC-PTC and/or the six New England states with potential public participation.</td><td></td></tr>
<tr><td></td><td>Explore Infection Prevention and Control staffing capacity levels. Explore infection control and prevention competency as part of licensing or credentialing for providers.</td><td colspan="2"><u>Extended Care Areas for Focus:</u>
• Enhance understanding of differences between acute and long term care environments, including patient and family education
• MDROs in long term care – recognition and management
• Accessibility to hand washing equipment/hand sanitizer & PPE
• IC issues with shared bathrooms, etc.</td></tr>
<tr><td rowspan="2">Engage in infection prevention activities.</td><td></td><td colspan="3">Develop and implement Infection Control Assessment and Promotion (ICAP) Program.
• Based on data from the DART Program, perform targeted assessments in infection prevention and control at healthcare facilities.
• Identify gaps and work through the HAI advisory council for state/region mitigation planning.
• Implement a response plan to address potential emerging threats identified by using enhanced surveillance.</td></tr>
<tr><td colspan="4">Acute Care: Collaborative programs hosted by Healthcentric Advisors [QIN-QIO], to reduce HAIs related to CLABSI, CAUTI, CDI, and VAE.</td></tr>
<tr><td rowspan="3">Expand antimicrobial stewardship</td><td>AMS education module and academic detailing continues for provider practices (MICIS).</td><td colspan="3">Engage HAI advisory council in developing state action plan for improving antibiotic usage in state.
• Begin with survey of healthcare facilities AMS surveillance programs.
• Explore impact of antibiotic shortage issues on AMS recommendations.
• Explore best practices for patient education that a specimen for culture obtained, results, and dosage of antibiotic regimen, if necessary. Choosing Wisely campaign materials may be useful.</td></tr>
<tr><td></td><td colspan="3">Promote Get Smart About Antibiotics Week (November) through public service announcements and media.</td></tr>
<tr><td></td><td colspan="2">State public health laboratory (HETL) to roll out study with clinical laboratories to conduct DNA analysis on isolates of multidrug resistant organisms (e.g. MRSA, VRE, CRE and VISA) in order to determine the resistance genes most frequently seen in Maine. The next class of antibiotics will target these resistance genes in bacteria. Share the findings with providers.</td><td></td></tr>
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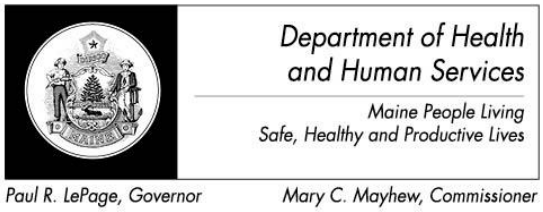

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Appendix F: 2017 Annual Report of the Maine Healthcare Associated Infections/Antimicrobial Resistance (HAI/AR) Collaborating Partners Committee

The HAI/AR Collaborating Partners Committee was formed in early 2015 under the joint auspices of the Maine Centers for Disease Control and Maine Quality Forum to, "assess and analyze the status of infection prevention and control in the state of Maine and make recommendations on state strategies for the reduction of healthcare associated infections across all healthcare settings."[51] Membership is voluntary and represents a broad range of professions and organizations including hospital-based physicians and infection preventionists, pharmacists, epidemiologists, nursing facilities, clinical pathology laboratories, accreditation and licensing, state healthcare associations and consumer representatives.

The Committee conducted 3 meetings during 2017 to discuss and review a range of topics including:

- The progress and status on implementing the different elements of the current four-year State HAI Plan (see Appendix E);
- New and pending HAI legislation in other states;
- The need to prepare for the emergence and spread of newer and more dangerous varieties of antibiotic-resistant germs and to inform pathology labs of state and federal resources to accurately and quickly detect them;
- A plan for MQF to contract with an independent organization to conduct detailed external validation studies of hospital-submitted HAI infection data and broaden the scope to cover a wider variety of HAI measures;
- On-going training and assessments to improve the ability of hospitals, public authorities and emergency medical services to coordinate and respond to dangerous outbreak of Ebola or similar highly infectious diseases;
- Maine CDC's development of patient education programs on anti-biotic resistance and plans for a new program to use diagnosis and pharmacy claims data from MHDO's all-payer claims database to identify trends and patterns in the inappropriate prescribing of antibiotics; and
- Establishing standardized methods for hospitals, nursing homes and ambulance services to communicate and provide enough information to each other to prevent disease transmission when patients with infectious diseases are transferred from one facility to another.

The Committee also adopted a series of recommendations, such as to:

- Expand HAI data collection beyond hospitals to include nursing facilities and outpatient dialysis centers;

[51] HAI Collaborating Partners Committee Operating Guidelines, (Augusta: March 2015)

- Amend chapter 270 to require:
    - All acute care hospitals to report quality measure data on surgical site infections (SSI) for knee and hip replacements, and catheter-associated urinary tract infections (CAUTI) the federal CDC's National Healthcare Safety Network (NHSN) beginning in 2020;
    - Outpatient dialysis centers to allow Maine CDC and MHDO to access the HAI data that CMS already requires them to report to NHSN;
    - Maine nursing facilities to collect and report facility-onset *C. difficile* LabID event data directly to MHDO; and
- Encourage hospitals to voluntarily submit their antibiograms (a table listing a count of each type of bacteria identified in hospital lab samples, and the percentage of samples found to be resistant to specific antibiotics) to allow the Maine CDC to report back to hospitals and the committee on statewide and regional trends in antibiotic resistance.

In the coming year, the committee plans, among other topics, to advise and assist Maine CDC in its development of the next federally mandated HAI State Plan, advise MQF and MHDO on proposed amendments to Chapter 270, and advise Maine CDC on developing guidelines to govern the public reporting of infectious disease outbreaks.

HAI/AR Collaborating Partners Committee: Operating Guidelines

(adopted at the Committee's inaugural meeting, March 3, 2015)

Mission:

The HAI/AR Collaborating Partners Committee will assess and analyze the status of infection prevention and control in the state of Maine and make recommendations on state strategies for the reduction of healthcare associated infections across all healthcare settings.

Objectives:

1. Provide guidance to the Maine Quality Forum (MQF) for the reporting of metrics related to healthcare associated infections for Chapter 270.
    a. Evaluate the completeness and the accuracy of reporting requirements.
    b. Establish priorities for external validation studies.
    c. Recommend additions and deletions of HAI related metrics.
2. Evaluate successfulness of the State HAI Plan and update as needs/priorities demand.
    a. Review infection prevention and control data on a state level.
    b. Develop mitigation strategies for addressing identified gaps in infection prevention and control.
    c. Analyze healthcare associated infection data by region to assess infection/pathogen threat.
    d. Provide guidance to address potential emerging threats.

Membership:

This volunteer committee shall include persons with expertise in the surveillance, prevention, and control of healthcare associated infections; safe and effective medication use; clinical laboratory testing, healthcare facility administration and nursing leadership; infectious disease and patient care; healthcare preparedness activities; accreditation and licensing; as well as representatives from applicable state healthcare associations and coalitions (see next page for list of members).

Staff:

This committee will be chaired by a representative from each of the following organizations:

- Maine Center for Disease Control (Maine CDC)
- Maine Quality Forum (MQF)

HAI/AR Collaborating Partners Committee Membership List

Organization	Representative	Title
APIC-Pine Tree Chapter Acute Care, IPPS facility	Dr. Gwen Rogers	Infection Preventionist Maine Medical Center
APIC- Pine Tree Chapter Acute Care, CAH facility	Ann Graves	Infection Preventionist Waldo County General Hospital
Maine Veterans' Home Long Term Care	Lynn Johnston	Infection Preventionist
Maine Healthcare Association Long Term Care	Bonny Small	Quality Improvement/ Regulatory Affairs
Maine CDC	Dr. Siiri Bennett	State Epidemiologist
	Rita Owsiak*	HAI Coordinator
	Jennifer Liao, PharmD	Antibiotic Resistance Coordinator
Maine Hospital Association	Sandy Parker	VP & General Counsel
Maine Quality Forum / Maine Health Data Organization	Karynlee Harrington*	Executive Director
Healthcentric Advisors (QIN-QIO)	Danielle Hersey	State Program Director
Husson Univ. School of Pharmacy / Eastern Maine Medical Center	Anthony Casapao, PharmD	Assistant Professor / Infectious Disease Clinical Pharmacy Specialist
Maine Health and Environmental Testing Laboratory (HETL)	Rick Danforth	CLIA Microbiology Supervisor
NorDx Laboratories	Cathy Dragoni	Chief Medical Technologist, Microbiology
St. Mary's Regional Medical Center	Dr. Sandy Harris	Infectious Disease Physician
Consumers for Affordable Healthcare	Emily Brostek	Executive Director
Consumer Representative	Kathy Day	Consumer Advocate
State of Maine: Public Health Emergency Preparedness	William Jenkins	Director Office of Public Health Emergency Preparedness, Maine CDC
State of Maine: Division of Licensing & Regulatory Services	Dale Payne	Health Surveyor Maine DHHS
Committee Staff	Brittany Roy	Maine CDC
	Stuart Bratesman	Muskie School of Public Service University of Southern Maine

* Committee Co-Chairs

Appendix G: 2017 Annual Report of the Association for Professionals in Infection Control (APIC), Pine Tree Chapter

The Association for Professionals in Infection Prevention and Control (APIC) is a national organization dedicated to improving patient safety by decreasing infection associated with the provision of healthcare. Maine's Chapter was established in 1998. The organizational focus includes:

- Demonstrate and support effective infection prevention and control as a key component of patient safety.
- Define, develop, strengthen, and sustain competencies of Infection Preventionists across the career span and support board certification in infection prevention and control (CIC).
- Influence and facilitate legislative, accreditation, and regulatory agenda for infection prevention with consumers, policy makers, health care leaders, and personnel across the care continuum.
- Promote and advocate for standardized, quality and comparable healthcare associated infection data.

APIC- Pine Tree Chapter (PTC) meets monthly and has several committees that were developed to meet the needs of its members as well as the needs of the patient population served by those members. Every member of the organization is required to participate in at least one committee. The monthly meetings provide education and interaction across the spectrum of care.

Recognizing that infection prevention is key to patient safety across the spectrum of care, the APIC Pine Tree chapter takes pride in facilitating conversations and support between Infection Preventionists from diverse backgrounds such as acute care, psychiatric care and long term care. Meetings with specific focus to long term care has allowed the Pine Tree Chapter to reach out to infection prevention partners in this area of healthcare to learn from one another about the challenges faced and the successes of overcoming those challenges.

Board certification within infection prevention shows one's commitment and dedication to the discipline as well as an avenue for continued learning. Certification in Infection Control (CIC) is supported by the Pine Tree chapter in a variety of ways. At each monthly meeting, time is set aside to review questions and content that prepare one to take the certification exam. Maine ranks as one of the highest states within the country in its number of certified Infection Preventionists. It is the hope of the Pine Tree Chapter that Maine can be the state with *the highest* number of CIC certified Infection Preventionists. Independent of their CIC status, members are encouraged to apply for financial support from the Pine Tree Chapter to attend the APIC Annual National Conference. Not only does this aid the individual in their growth as an Infection Preventionist, but it also helps broaden the knowledge of their peers both within the Pine Tree Chapter and their organizations as well, through information sharing upon their return.

Continuity of data is an important aspect to support the continued evolvement of infection prevention and patient safety within the State of Maine. The Pine Tree Chapter works to ensure data that is entered into the National Healthcare Data Network (NHSN) is consistent and precise. Through collaboration with the Maine CDC

and the HAI Coordinator, data validation is done routinely as a way to ensure criteria is being applied consistently to determine when an infection is deemed one that is healthcare-associated. The Pine Tree Chapter works routinely as a group to review and apply the definitions set forth by NHSN through case studies. Ensuring the data from which statewide decisions may be made from is critical to patient safety and the elimination of healthcare-associated infections.

The Pine Tree Chapter collaborates regularly with the Maine CDC, most notably with the Healthcare Associated Infection (HAI) Coordinator and her team. This relationship is key in helping Infection Preventionists ensure they are aware of changes within surveillance rules, validation processes and procedures, as well as trends and patterns related to infection disease incidence not only within the State of Maine, but nationally as well. An exciting potential exists with the Antibiotic Stewardship Coordinator as this work could prove beneficial to addressing *C. difficile* infections within the State of Maine.

Support of the Maine HAI Collaborative is important to the Pine Tree Chapter. Collaboration through this group ensures Infection Prevention measures are well thought out and takes into consideration the needs of patients from different levels of care. From acute care hospitals to critical access and skilled and long term care nursing facilities, the needs of the patients within these facilities may be slightly different. The work the Maine HAI Collaborative does ensures the needs of *all* patients are met. The Pine Tree Chapter is appreciative and proud to be a part of such a diverse and important group.

The Pine Tree Chapter will hold a Fall Conference in September 2018 in Portland to bring members from all across the healthcare continuum from Maine and New Hampshire together for a one-day educational session. In years past, we've had partners from skilled nursing and long term care, environmental services and sterile processing departments attend our conferences. This shows the large impact that infection prevention has on the safety and outcomes of patient care.

Finally, the Pine Tree Chapter has been recognized as a leading chapter on the national stage. As a group, the Pine Tree Chapter has received numerous awards for chapter engagement, specifically speaking to legislative decisions being made nationally in Washington, D.C. Individual members have also received awards recognizing their tireless work within the Pine Tree Chapter in providing current education that is applicable across the healthcare spectrum. The membership of the APIC Pine Tree Chapter is the backbone of Infection Prevention measures within the State of Maine and is committed to providing the very best insight to provide the safest care to the patient population of Maine.

Appendix H: The Skilled Nursing Infection Prevention Program

Under contract with the Maine Quality Forum, the Muskie School of Public Service e-Learning team has designed and administered an online training curriculum to provide basic infection prevention and control training to Maine nursing facility staff charged with the infection preventionist (IP) role in their facilities. Currently, many individuals functioning in this role at Maine skilled nursing facilities (SNFs) have had little preparation and coordinated training for their work in prevention, surveillance, control of active infections and performance improvement.

Since the training went online in March 2016, it has delivered an 8-hour core curriculum to 271 IPs, nurses and other staff, through an asynchronous 24-hour online distance education portal. Participants receive training in five core content areas:

- general infection control and prevention practices;
- common infectious diseases;
- infection surveillance and data handling;
- performance improvement; and
- antimicrobial stewardship.

Participants can complete the five stand-alone modules at the convenience of their own schedule. The modules were developed with the assistance and guidance of the HAI Coordinator at the Maine CDC, and the Maine Pine Tree Chapter of APIC (the Association of Professionals in Infection Control). Participants receive a signed certificate from the Commissioner of the Maine Department of Health and Human Service upon the successful completion of all six modules.

In 2017, the Muskie School also added three continuing education modules geared toward all staff at extended care facilities:

- Blood-borne Pathogens for Clinical Staff;
- Blood-borne Pathogens for Non-Clinical Staff; and
- Biological Hazards.

These additional courses were funded through a Susan Harwood grant provided by the U.S. Department of Labor.

Proper training for long term care facility staff can decrease healthcare associated infections (HAIs) in nursing homes and other facilities. IPs play a key role in reducing catheter associated urinary tract infections (CAUTI), the transmission of antibiotic-resistant C. Difficile bacteria, and the risk of development of other drug-resistant organisms through a rigorous antibiotic stewardship program. Having a strong infection prevention program in an extended care facility also decreases the spread of HAIs from residents to other patients when residents are transferred to the hospital.

Appendix I: Healthcentric Advisors' HAI prevention report

State of Maine Report – NE QIN-QIO Collaboration

The New England Quality Innovation Network / Quality Improvement Organization (NE QIN-QIO) is a part of a CMS collaborative to help prevent patients from developing healthcare-associated infections (HAIs) in the hospital. The NE QIN-QIO contract is administered by Healthcentric Advisors in partnership with Qualidigm. The Maine staff is located in Brunswick and works with a regional team across the 6 states in New England. The regional collaborative connects healthcare professions across New England to share best practices and improve patient safety.

The collaborative provides training and support (at no cost to the hospitals) on clinical topics to improve patient outcomes, reduce healthcare-acquired conditions (HAC) and improve hospital value-based purchasing (HVBP) scores. Educational offerings include topics on central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), catheter utilization, clostridium difficile infections (CDI) and the CDC's ventilator-associated events (VAE) algorithm. A full offering of previous education events can be found on our website at http://www.healthcarefornewengland.org/providers/hospital/ . If you would like to be on the list serve for future webinar offerings please email Danielle Hersey, State Program Director, at dhersey@healthcentricadvisors.org .

The CMS contract requires that the NE QIN QIO work directly with 7 Maine hospitals on HAIs however the response in Maine was tremendous and we are currently working with 18 hospitals on HAI initiatives. The Maine staff is available for support on most of the CMS hospital initiatives. Part of the collaborative work is providing technical assistance to the hospitals in Maine on the National Healthcare Safety Network (NHSN), monitoring unit-level infection rates for CLABSI, CAUTI and facility-wide CDI; offering assistance to facilities struggling with higher than expected rates of infection. The goal is to improve patient satisfaction and promote a culture of safety through enhanced teamwork and communication. The NE QIN QIO also produces quarterly reports for the participating hospitals to assist with monitoring their infection rates.

The NE QIN QIO is here to support the efforts of the Maine's hospitals to reduce HAIs in the facilities. For more information please contact Danielle Hersey, State Program Director, at dhersey@healthcentricadvisors.org or by calling (207) 406-3960.

14 Maine Street, Suite 208, Brunswick, ME 04011 * (207) 406-3950

Appendix J: Glossary of Terms

Antibiotic (or antimicrobial) stewardship – programs and guidelines that promote the appropriate selection and use of antibiotics, to improve patient outcomes, reduce the emergence of multidrug-resistant organisms, and reduce the spread of multidrug-resistant infections. These programs aim to avoid the use of antibiotics for diseases and infections they don't treat, such as the common cold or other viruses. However, when it is appropriate to use antibiotics, it is very important to choose the correct antibiotic and to use it for the appropriate length of time. Proper use of antibiotics leads to higher cure rates, reduced side-effects, shorter hospital stays, lower medical costs, and reduced risk of acquisition or spreading of drug-resistant bacteria.[52]

Bloodstream infection – an infection caused by bacteria that have entered the bloodstream through a wound, injury, injection, central-line catheter (see "*central line catheter-associated bloodstream infection*"), surgical procedure or other infection (such as pneumonia). Bloodstream infections can cause a variety of symptoms including fever and in some cases, potentially life-threatening septic shock.

Catheter-Associated Urinary Tract Infections (CAUTI) – an infection that enters the body due of the insertion or continued use of a urinary catheter

Centers for Medicare & Medicaid Services (CMS) – The federal agency within U.S. Department of Health and Human Services responsible for running the Medicare program and for overseeing each states' Medicaid program (known here as MaineCare).

Central Line Catheter-Associated Bloodstream Infection (CLABSI) – an infection that enters the body through the insertion of a catheter that enters one of the major veins near the heart (see *"bloodstream infection"*).

Central line days – Each day a patient has a central-line catheter in their body counts as a central line day. To count the number of central line days for a year, the hospital takes a daily count of the number of patients who had a central line catheter each day and then adds all the daily counts together.

Chapter 270 – The chapter of the Maine State Agency Rules formally known as "90-590 Chapter 270: Uniform Reporting System for Quality Data Sets". It specifies which organizations are required to report, identifies which quality measures they report, and defines methods and standards for data submission.

Clostridium difficile (C. difficile) – a spore-forming bacteria that can cause serious and sometimes fatal cases of diarrhea. It is the leading cause of stomach and intestinal-related death and was associated with nearly 30,000 U.S. deaths in 2011.[53] Drug-resistant *C. difficile* can grow and thrive when competing intestinal bacteria are killed off by antibiotics – a major cause of serious *C. difficile* infections.

Critical Access Hospitals (CAH) – a CMS designation for smaller and predominantly rural hospitals limited to no more than 25 beds and an annual average acute care length of stay of under four full days. Unlike Inpatient

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[52] "Get Smart for Healthcare: Core Elements of Hospital Antibiotic Stewardship Programs", U.S. Centers for Disease Control and Prevention, March 4, 2014, web page accessed on May 7, 2015 at: http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html

[53] Lessa, Fernanda C., et. al, "Burden of *Clostridium difficile* Infection in the United States", New England Journal of Medicine, (2015), Vol. 370, pp. 825-834, accessed on May 7, 2015 at: http://www.nejm.org/doi/full/10.1056/NEJMoa1408913#t=articleTop

Prospective Payment Hospitals (see below), Medicare reimburses CAHs on a fee-for-service basis at one percent above reasonable costs.

Drug-resistant bacteria – bacteria that are hard to treat because they have become immune to at least one type of antibiotics

HAI Data Set – the group of five quality indicators specified by Chapter 270 that measures the prevention of healthcare associated infections that can be caused by the use of a central-line catheter, umbilical catheter (in neonates), urinary catheter, or a mechanical device (known as a ventilator) used to assist a patient's breathing. The two HAI indicators that measure the actual rate of infection were designed and maintained by the federal CDC. The three HAI indicators that measure documented compliance with best practices to prevent infection are maintained by the Institute for Healthcare Improvement (IHI).

Healthcare Associated Infection (HAI) – a disease that infects a patient while he or she is in a healthcare setting such as a hospital, outpatient care center, nursing home or doctor's office.

Hospital Peer Groups – The Maine Hospital Association uses bed size to categorize hospitals into five peer groups. Peer Group A currently represents the state's four largest hospitals, while Critical Access Hospitals belong to Peer Group E.

Infection Preventionist (IP) – healthcare professionals working in hospitals or other healthcare settings who develop education, training and other programs for doctors, nurses, other hospital staff, patients, and visitors to prevent and reduce the spread of HAIs.

Institute for Healthcare Improvement (IHI) – a Massachusetts-based independent non-profit organization that operates worldwide to promote tested and proven methods to improve the quality of healthcare, patient safety, and to reduce costs through quality improvement. IHI developed some of the quality measures used in this report.

Inpatient Prospective Payment System (IPPS) – the method used by CMS to determine the amount of payment for each Medicare beneficiary inpatient stay at most acute care hospitals. The system calculates the size of the payment based on diagnoses and the severity of illness or injury.

Maine Centers for Disease Control and Prevention (Maine CDC) – is the public health agency for the State of Maine. Working in conjunction with health care providers, the federal CDC, and other partners, Maine CDC acts to keep Maine people healthy and to prevent the spread of disease.

Maine Health Data Organization (MHDO) – an independent state agency that created the nation's first all-payer claims database (a collection of all Maine medical and pharmacy claims paid by private insurers, MaineCare and Medicare) and collects the data for the Chapter 270 quality measures. When MHDO recognizes the need to make changes to Chapter 270, it submits their recommendations to the Maine Legislature.

Maine Quality Forum (MQF) – an independent state agency that provides the public with, "a reliable resource for information about health maintenance, health care and quality of health care services and health information." MQF also advises MHDO on the need to make changes in Chapter 270.

Methicillin-resistant *Staphylococcus aureus* (MRSA) – is a drug-resistant strain of staph bacteria that can cause a difficult-to-treat and sometimes deadly infections in the skin, bone, respiratory tract, bloodstream, or at the site of surgical incisions.

National Healthcare Safety Network – the federal CDC's nationwide tracking system for HAIs. More than 12,000 hospitals and other medical facilities from around the country submit data on every HAI infection identified in their facility. The data is used to uncover problem areas and to measure progress in HAI prevention. Some of the hospital data used in this report was obtained by Maine CDC from the NHSN.

Outcomes measures – quality indicators designed to measure the percent of times that something turns out well or badly. The outcomes measures covered by Chapter 270 calculate how often patients get a bad infection while they are being treated in the hospital.

Process measures – quality indicators designed to measure how well or how often a hospital or provider follows proven and tested medical guidelines that are known to prevent harm or to improve health. The process measures required by Chapter 270 calculate how often hospitals follow proven medical guidelines to prevent patients from being infected during surgery or a hospital stay.

Statistical significance – a measure of the probability (or "P value") between zero and one that the difference between two rates or averages might be only due to random chance. The smaller the P value, the lower the probability that the difference between two rates was due to chance. A P value of 0.40 would mean a 40% probability that the difference could have been due to chance, while a P value of 0.01 means the probability was only 1%.

The P values in this report were calculated with a widely used statistical formula called a two-tailed t-test. When a ▲("better") or ▼("worse") symbol appears next to a hospital's name or score, it means the difference between the hospital's rate and the statewide rate had a P value of 0.05-or-lower (often referred to as, "statistically significant at the 0.05 level").

It may seem strange when you see no symbol next to Hospital A whose score had a big difference with the statewide rate, while Hospital B gets a ▲ or ▼ symbol despite its score being much closer to the statewide average. However, it's explained by Hospital A being a small facility with a score based on only a few events, while Hospital B is larger with a rate based on hundreds or maybe thousands of events. Or think of it this way: If the Red Sox were ahead of the Yankees after only the first four days of the baseball season, it would be hard to know whether they were ahead by skill or due to a couple of wind gusts and two-or-three random bad calls by the ump. However, if the Sox were still ahead by mid-September, it's a lot safer to say their lead was due to talent and playing better baseball.

Ventilator-associated pneumonia (VAP) – a pneumonia infection occurring either while a patient's breathing was assisted by a machine that delivers oxygen through a tube placed in the patient's mouth, nose or through a hole in the patient's neck[54], or when the pneumonia develops within 48 hours after the ventilator use had been discontinued.[55]

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[54] "Frequently Asked Questions about Ventilator-Associated Pneumonia", U.S. Centers for Disease Control and Prevention, web page accessed on May 7, 2015 at: http://www.cdc.gov/HAI/pdfs/vap/VAP_tagged.pdf

[55] "Measures: Ventilator-Associated Pneumonia (VAP) Rate per 1,000 Ventilator Days", Institute for Healthcare Improvement, web page accessed on May 7, 2015 at: http://www.ihi.org/resources/Pages/Measures/VentilatorAssociatedPneumoniaRateper1000VentilatorDays.aspx