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DATE: April 4, 2014

TO: Senator Craven, Representative Farnsworth and Members of the Joint Standing Committee on Health and Human Services

FROM: Karynlee Harrington, Executive Director, Maine Quality Forum

CC: Jane Orbeton, Legislative Analyst
Dr. Stephen Sears, State Epidemiologist
Dr. Robert Keller, Chair of Maine Quality Forum Advisory Council

RE: 2014 Annual Report of Healthcare Associated Infections in Maine

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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 2014 Annual Report on Healthcare Associated Infections (HAI) in Maine.

The report provides a significant amount of information on the specific HAI data that the Maine Health Data Organization (MHDO) collects from Maine hospitals and from the National HealthSafety Network (NHSN) per Rule Chapter 270.

The data contained in this report reflects compliance and performance rates in the aggregate and by hospital by peer group for the most recent reporting period. The report also provides data on prior years (when available) in order to establish a trend line.

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

Please do not hesitate to contact me or Dr. Sears with questions.

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2014 Annual Report

Healthcare Associated Infections in Maine

Submitted to:

Joint Standing Committee on Health and Human Services

Prepared by:

Karynlee Harrington, Executive Director
Dirigo Health Agency/Maine Quality Forum

April 4, 2014

This report is submitted by the Dirigo Health Agency's 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, under contract with the Dirigo Health Agency, provided technical support in the preparation of the report.

[1] 24-A MRSA §6951.

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Executive Summary

Healthcare Associated Infections (HAIs): Harmful, costly, and largely preventable.

Healthcare Associated Infections (HAIs) – infections acquired by patients in healthcare facilities – can lead to medical complications, prolonged hospital stays, and death. When the words "superbug" and "antibiotic resistance" make headline news, the dangers of HAIs capture attention. When the publicity fades, HAIs do not.

Major causes of hospital infections include inadequate hand washing, uneven use of proven infection control procedures, and bacteria becoming resistant to antibiotics. The good news is that these infections can largely be prevented. Many in Maine are working hard to achieve this.

The full report shares HAI trends based on data reported by Maine hospitals.

Maine hospitals are required to report data to the State (Maine Health Data Organization) on either how often HAIs occur or measures they take to prevent:

- Surgical site infections
- Central line catheter-associated blood stream infections
- Ventilator associated pneumonia
- Cases of MRSA (Methicillin-resistant Staphylococcus aureus)
- Cases of C. difficile (Clostridium difficile)

Positive trends

The Maine statewide average has improved over the past 5 years in 2 areas:

1. *Surgical site infections*. Although some Maine hospitals do better than others, overall they have improved compliance with 4 proven methods for preventing surgical site infections.
2. *Infections related to the use of central line catheters* in *adult* intensive care units. The overall trend reflects improved compliance with proven methods for preventing infections when central line catheters are used in *adult* intensive care units. Again, some hospitals do better than others.

Less favorable trends

The Maine statewide average has declined over the past 5 years in 2 areas. In both cases, some hospitals are doing well, while others not as well.

1. *Ventilator associated pneumonia*. A few hospitals have low rates of compliance with practices known to prevent pneumonia in patients on ventilators. Most of the 27 hospitals with patients eligible for this measure complied with prevention practices 90% or more of the time.
2. *Infections related to the use of central line catheters* in *neo-natal* intensive care units. The rate of infection related to the use of catheters among infants in *neo-natal* intensive care units varies from year to year. The number of infections is very small, but the rate has increased slightly over the past 5 years.

Infections to watch: MRSA and C. Difficile

MRSA and *C. difficile* are bacterial infections often resistant to antibiotics. Maine began collecting data on the rate of these infections only 2 years ago, so it is too soon to establish a trend. Based on this limited data, *MRSA* rates have been **declining** in Maine, as well as nationally. However, nationally and in Maine, rates of *C. difficile* have been **rising.**

Use caution in interpreting the report's data charts for individual Maine hospitals.

While the State carefully collects and analyzes data about healthcare associated infections, readers should be aware that HAI data:

- May reflect a very small number of cases. Among smaller hospitals, a large difference in rates may be due to just 1 or 2 infections.
- Is not risk-adjusted. This means that hospitals with higher numbers of very sick patients may be at risk for higher rates of HAIs.
- Is self-reported by each Maine hospital. Only rates of MRSA and C. difficile are independently validated by the Maine CDC.

State agencies, hospitals, and consumers are working together to tackle HAIs in Maine.

Preventing and reducing HAIs requires a team effort. Public, private, and non-profit groups, and consumers in Maine collaborate to address this challenge. Each group brings unique focus and expertise. Working together leads to collective success. Groups listed below are referenced in the full report.

Agency or Group	Mission/Action
Maine Health Data Organization	Sets reporting standards and collects HAI data from Maine hospitals
Maine Centers for Disease Control and Prevention	Tracks national and state trends in HAIs, provides training to healthcare personnel, validates HAI data on MRSA and C. difficile, and develops an annual HAI Prevention Plan
Maine Quality Forum	Publicly reports status of HAIs in Maine to the State legislature each year with support from the Muskie School of Public Service
HAI sub-committee of the Maine Quality Forum	Builds awareness and represents the interests of consumers and other stakeholders related to HAIs
Maine Infection Prevention Collaborative	Includes infection control specialists from Maine hospitals who learn and share best practices in infection control with hospital care providers

Maine consumers and legislators also play important roles in HAI prevention.

Consumers can:

- Bring an 'advocate' to the hospital to observe hand washing and ask questions as needed.
- Not press for antibiotics if a doctor says they are *not* needed.
- Question suggested tests, interventions, and treatments to make sure they *are* needed.

Legislators can:

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

"Wait and see" is not an option. Preventing HAIs requires ongoing vigilance and resources.

As HAI bacteria become more drug-resistant, they grow more deadly and more difficult to prevent. The national CDC reports an emerging threat of a new family of germs even more difficult to treat than MRSA or C. difficile.

The Leapfrog Group, a national employer-based coalition which advocates for patient safety, recently ranked Maine as #1 in the country across many patient safety measures. We can take pride in this ranking, but understand that we can't afford to let down our guard. Only constant vigilance and continued support for HAI prevention efforts will protect us when we most depend on it.

Note to Reader: Shortly before releasing this Report, the federal CDC released the 2014 edition of its National and State Healthcare-Associated Infections Progress Report. The numbers presented in the federal CDC's report for Maine cannot be compared to those in this report, because the two reports measure something entirely different from each other. While this report compares today's Maine infection rates to the Maine infection rates of earlier years, the federal CDC compares Maine's 2012 Standard Infection Ratio (SIR) to the national SIR from an earlier baseline year.

What are Healthcare Associated Infections (HAIs)?

Healthcare Associated Infections (HAIs) 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 more than 80 percent of all HAIs across the U.S:[2]

- Surgical site infections
- Catheter-associated urinary tract infections
- Central line catheter-associated bloodstream infections
- 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 emergence of drug-resistant bacteria is accelerated by the widespread overuse and misuse of antibiotics. Curbing this misuse has gained growing attention in Maine and nationally.

Two of the most common drug-resistant bacteria are known as *Methicillin Resistant Staphylococcus aureus* (MRSA) and *Clostridium difficile* (C. difficile). While still a serious threat, MRSA HAIs have begun to decline nationally, and in Maine. Much of this decline illustrates the success of the coordinated efforts of many entities including Maine hospitals, Maine Centers for Disease Control (Maine CDC) and the Maine Quality Forum. However, HAIs from drug-resistant C. difficile are now more common than MRSA and still rising.

More recently, the federal Centers for Disease Control (CDC)and Prevention have published advisories on the emerging threat of Carbapenem-resistant Enterobacteriaceae (CRE), a family of germs even more difficult to treat due to their higher levels of antibiotic resistance.[3] 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. Although not yet common in Maine, CRE has been found across most of the rest of the country.

Why do HAIs matter?

Although the rate of HAI infections occurs at relatively low frequency, their impact is significant—these infections are associated with morbidity, mortality, and excess health care costs. These complications often strike when a patient has already been weakened by the original disease or surgery, which is why

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[2] Agency for Healthcare Research and Quality. Patient Safety Network. "*Patient Safety Primer: Health Care-Associated Infections*". Last modified October 2012. Accessed April 1, 2013 at: http://www.psnet.ahrq.gov/primer.aspx?primerID=7..

[3] Centers for Disease Control and Prevention, "Antibiotic Resistance Threats in the United States, 2013.", Atlanta, GA: United States Department of Health and Human Services, CDC; April 23, 2013. http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf, Accessed January 29, 2014.

the resulting conditions can be devastating. HAI infections prolong hospital stays and can create long term disability and decrease a patient's resistance to other diseases. As HAI bacteria become more drug-resistant, they also become more deadly. Between 1997 and 2004, the national death rate for C. difficile infections rose nearly five-fold from 1.5% to 6.9%.[4]

Beyond the personal burden, HAIs contribute to higher healthcare costs. Citing the most recent study conducted in this area, the federal CDC states that 99,000 Americans lost their lives to these infections in 2002.[5] The CDC also reports that in 2009, HAIs added an average $16,000 to $19,000 to each hospital patient's bill, and increased our national healthcare system's costs by an extra $28.4 to $33.8 billion.[6]

Healthcare associated infections are a serious national and state problem, but we have learned that there are basic and effective strategies that consumers, their caregivers and healthcare providers can take to reduce and even eliminate their incidence. The initial focus for prevention has been directed toward hospitals where strong infection control practices have been instituted, such as safer use and maintenance of medical devices (e.g., ventilators and catheters), training of health care workers 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. Yet we know that medical care that once occurred only in hospitals has branched out to ambulatory surgical centers, nursing facilities, and the home. Many HAIs in these settings are due to poor basic infection-control practices such as improper sterilization and disinfection methods, reuse of syringes and needles, and using single-use medication vials for multiple patients.[7]

How does Maine measure HAIs?

Hospitals have been the central focus for HAI measurement since the acute care setting is where infections are the most common complication of care and where there is the greatest opportunity for prevention. The Maine Quality Forum is required to adopt a set of measures to evaluate and compare health care quality and provider performance. The quality measures adopted by the forum are the basis for rules promulgated by the Maine Health Data Organization. Rule Chapter 270 defines the health care quality data sets, including measures related to HAI, and the provisions for filing data by health care providers to the Maine Health Data Organization. Under Chapter 270 Maine hospitals are required to report data to the Maine Health Data Organization on each HAI measure using a consistent and standard format.

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

[5] Klevens RM, Edwards, JR, Richards CL, Horan TC, Gaynes RP, Pollack DA, and Cardo DM. Estimating Healthcare Associated Infections and Deaths in U.S. Hospitals, 2002. Public Health Reports 2007:122.

[6] 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

[7] "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.

There are two types of HAI measures, process measures and outcome measures.

1. ***Process measures*** focus on a hospital's 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 the HAI infection rates.

Since 2012, the Maine Quality Forum has had access to HAI data submitted by hospitals to the National Health Safety Network , a secure internet-based surveillance system at the federal CDC. These data allow Maine to conduct meaningful analyses of how well hospitals are conforming to evidence-based guidelines to prevent HAIs and the actual impact those practices have on four outcomes:

1. the rates of central catheter-associated bloodstream infections (CLABSI) across all age groups,
2. CLABSI infections in neo-natal intensive care units,
3. MRSA infections, and
4. C. difficile infections.

Prior to public reporting, the Maine CDC validates MRSA and C. difficile infection data submitted by hospitals via the federal National Health Safety Network.

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. Measures are all collected at the hospital-specific level and all but four measures (MRSA, C. difficile, SCIP- 9 and SCIP-10) have been collected for six years.

TABLE 1 – Summary HAI Process and Outcome Measures Collected in Maine

Type of Infection	Data Availability	Process Measures	Outcome Measures
Central line catheter-associated bloodstream infections (CLABSI)	July 2006 – June 2013	• Compliance with all 5 evidence-based interventions for patients with intravascular central catheters in intensive care units (**HAI-3**). • 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 (**HAI-1**) • Number of catheter-related blood stream infections among neo-natal intensive care unit patients per 1,000 central line catheter or umbilical days (**HAI-2**).
Surgical site infections (SSI)	July 2006 – June 2013 (except SCIP-9 for which data are available for only one year – July 2012 thru June 2013 and SCIP-10 for which data are available for only two years – July 2011 – June 2013)	• Percent of all patients receiving an antibiotic within 1 hour prior to any surgery (**SCIP-1a**) • Percent of surgery patients receiving the recommended antibiotic for their procedure (**SCIP-2a**) • Percent of surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended (**SCIP-3a**) • Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose (**SCIP-4**) • Percent of surgery patients whose urinary catheters were removed on Postoperative Day 1 or Postoperative Day 2 with day of surgery being day zero (**SCIP-9**). • Percent of surgery patients with peri-operative temperature management (**SCIP-10**)	No outcome measures collected
Ventilator associated pneumonia (VAP)	July 2008 – June 2013	Percent documented compliance with pneumonia prevention measures among intensive care unit patients on ventilators (**HAI-5**)	No outcome measures collected
Methicillin-resistant Staphylococcus aureus (MRSA)	July 2011 – June 2013	No process measures collected	MRSA rates per 1,000 patient days[8]
C. difficile	Oct 2011 – Sept 2013	No process measures collected	C. difficile rate per 10,000 patient days

[8] Beginning with the 12-month reporting period for the 2015 Annual Report, Maine CDC is simplifying hospital reporting specifications for MRSA by limiting the measure to laboratory-identified cases.

The practice and science of measuring HAIs is still evolving. The Maine Quality Forum is committed to using the most current evidence to examine how well Maine hospitals are doing in preventing HAIs. The Maine Quality Forum will continue to work with the Maine CDC, the Maine Infection Prevention Collaborative and other stakeholders to add new measures that can provide reliable and actionable information on how Maine can reduce the devastating impact of these infections. The Maine Quality Forum may also recommend that a measure be retired once all Maine hospitals consistently reach 99-100 percent compliance levels. For example, Maine no longer requires hospitals to collect data on the percent of patients who had proper hair removal prior to surgery (SCIP-6) given that all hospitals approached 100 percent compliance.

How does Maine collect HAI data?

Since 2005, Rule Chapter 270 has required 36 Maine's hospitals* to report data on a variety of quality measures to the State's Maine Health Data Organization (MHDO), the state's data center. Chapter 270 with the full list of hospital quality measures can be found at https://mhdo.gov/rules.htm.

Revisions to Rule Chapter 270 require Legislative action. In 2013, the Legislature added one new HAI-related quality indicators to Chapter 270 (SCIP-9) and updated the reporting requirements for MRSA and C. difficile. Also this past year, the Legislature authorized MHDO to update the technical specifications of measures to synchronize with changes made by a measure's national authority.

Regarding the HAI-related measures currently required by Chapter 270, Maine hospitals report data for some measures directly to MHDO. However, for measures also collected by the federal CDC or the Centers for Medicare & Medicaid Services (CMS), hospitals need only report to them, and they, in turn, share that data with MHDO.

How does Maine analyze HAI data?

Once MHDO collects the data, they forward most of it directly to the Maine Quality Forum. Under contract with the Maine Quality Forum, with the Muskie School of Public Service analyzes the data and prepares the results for this report.

Information on MRSA and C. difficile infections that hospitals report to the federal CDC follows a different path. The federal CDC shares those individual records with the Maine CDC. Maine CDC first "validates" or reviews the records for accuracy. Once validated, the Maine CDC counts the total number of cases for each hospital and reports these totals to MHDO and the Maine Quality Forum.

* APPENDIX A lists all Maine hospitals by peer group.

How well is Maine preventing HAIs?

The four categories below summarize how well Maine hospitals are doing overall in managing HAIs. Category 1 and 2 reflect areas of greatest accomplishment.

Readers wanting to see how individual hospitals are performing under each measure may refer to the page numbers identified in the following tables. In addition, statewide trend charts for each measure are shown in APPENDIX B.

Category 1 Near Perfect Performance: All hospitals were at 98 percent compliance or better in the most recent reporting period.

Measure Group	Description	Hospital-Specific Rates
Surgical Site Infections (SSI)	Percent of surgery patients receiving the recommended antibiotic for their procedure (SCIP-2a)	Page 27

Maine hospitals have little room for improvement on the SCIP-2a surgical site infection measure. Between the 2008-09 and 2012-13 reporting periods, statewide hospital compliance with the SCIP-2a measure went from 99.0% of all surgeries to 99.4%. During the 12 months ending in June 2013, 24 out of 34 Maine hospitals reported a perfect 100% performance and the rest were at 98%-or-better. (In addition to the 34, two small hospitals reported having no surgeries.) The goal for this Category 1 measure is to sustain high performance.

Category 2 Improved Performance: Statewide performance has improved over the past five years

Measure Group	Description	Hospital-Specific Rates
Central line catheter-associated bloodstream infections (CLABSI)	The weighted average rate of central line catheter-associated blood stream infections per 1,000 intensive care unit central line days (HAI-1)	Page 16
	Compliance with all 5 evidence-based interventions for patients with intravascular central catheters in intensive care units (HAI-3)	Page 21
	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 23
Surgical Site Infections (SSI)	Percent of all patients receiving an antibiotic within 1 hour prior to any surgery (SCIP-1a)	Page 24
	Percent of surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended (SCIP-3a)	Page 29
	Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose (SCIP-4	Page 30

Maine hospitals have improved their overall statewide performance, compared to five years earlier, on six of our 13 HAI-related quality measures.

The statewide rate of central line catheter-associated blood stream infections (CLABSI) per 1,000 central line days in hospital ICUs (HAI-1) was cut in half between the July-to-June reporting periods of 2008-09 and 2012-13. The overall rate is now just 1.1 infections per 1,000 catheter line days. Twenty-four of the 33 Maine hospitals (73%) that used central line catheters in the latest 12-month reporting period had zero CLABSI infections.

In that same time frame, overall compliance with the HAI-3 process measure improved from 84.3% to 90.0%, and compliance with HAI-4 improved more dramatically from 86.9% to 96.0%. In the latest reporting period, more than half of Maine hospitals reported 100% compliance with HAI-3, and nearly 80% of the 29 hospitals that used central line catheters before, during or after surgery reported 100% compliance with HAI-4.

Among the three Surgical Site Infection prevention measures where Maine hospitals showed five-year improvement, overall compliance with the SCIP-1a climbed from 97.4% to 99.0%, SCIP-3 improved from 97.1% to 99.2%, and SCIP-4 rose from 95.1% to 98.2%.

The goal for Category 2 measures is to target improvement within specific hospitals and to sustain the performance of the others.

Category 3 Declining Performance: Statewide performance has declined over the past five years

Measure Group	Description	Hospital-Specific Rates
Central line catheter-associated bloodstream infections (CLABSI)	Number of catheter-related blood stream infections among neo-natal intensive care unit patients per 1,000 central line catheter or umbilical days (HAI-2)	Page 19
Ventilator associated pneumonia (VAP)	Percent documented compliance with pneumonia prevention measures among intensive care unit patients on ventilators (HAI-5)	Page 34

The Maine statewide average performance on two measures, HAI-2 and HAI-5, declined over the past five years. Between the July-to-June reporting period for 2008-09 and 2012-13, the Maine rate of catheter-related blood stream infections (CLABSI) among neonatal ICU patients per 1,000 central-line catheter or umbilical days (HAI-2) rose by more than half, from 1.8 per thousand to 2.9 per thousand. Since there are only three neonatal ICUs in the State, this measure is only reported by three hospitals, which are among Maine's largest.

Maine hospital compliance with best practices for preventing pneumonia among ICU patients on ventilators to assist breathing (HAI-5) has varied little over the past five 12-month reporting periods, having declined by only six-tenths-of-one-percent from 2008-09 to 2012-13. The overall rate of compliance dropped from 89.9% to 89.3% over those five years.

The goal for Category 3 measures is targeted improvement in low performing hospitals and sustained improvement for those that are at or close to 100 percent compliance.

Category 4 Newer Measures: Data collection has been too brief to establish a trend

Measure Group	Description	Hospital-Specific Rates
Drug-resistant disease organisms	Methicillin-resistant Staphylococcus aureus (MRSA)[9]	Page 38
	Clostridium difficile (C. difficile)	Page 41
Surgical site infection (SSI)	Percent of surgery patients whose urinary catheters were removed on Postoperative Day 1 or Postoperative Day 2 with day of surgery being day zero (SCIP-9)	Page 31
	Percent of surgery patients with perioperative temperature management (SCIP-10)	Page 33

Four of Maine's HAI-related quality measures have not been collected long enough to establish a trend. This is the second year that the Maine CDC has collected and validated data on MRSA and C. difficile healthcare-associated infections that Maine hospitals submit to the National Health Safety Network. They have collected MRSA data for two 12-month reporting periods beginning in July 2011 and July 2012, and collected C. difficile data for two 12-month reporting periods beginning in October 2011 and October 2012.

Between the October-to-September reporting periods for 2011-12 to 2012-13, the number of MRSA HAI infections reported by Maine hospitals fell from 113 to 99. Maine's hospital MRSA HAI rate per 1,000 hospital days improved from 0.19 per thousand to 0.16 per thousand. However, the difference in the number of infections was too small to statistically rule out random chance as the cause of the improvement.

During the same period, Maine's combined number of C. difficile HAI infections[10] increased from 398 to 415 as the rate went up from 6.6 cases per 10,000 patient days to 6.9 cases per 10,000 patient days.

[9] Beginning with the 12-month reporting period for the 2015 Annual Report, Maine CDC is simplifying hospital reporting specifications for MRSA by limiting the measure to laboratory-identified cases.

[10] C. difficile HAIs includes Hospital Onset (HO) infections and Community-Onset Health Care Facility Associated (CO-HCFA) infections. Cases are categorized as HO if first identified in a sample taken more than 3 days after hospital admission. If C. difficile is identified in a sample from an outpatient setting or during the first 3 days of a hospital stay, and if the patient had a documented hospital admission or long term care stay within the previous 12 weeks, then the case is tallied in the CO-HCFA category.

However, just as we saw with MRSA, the difference in the number of cases was still statistically too small to rule out random chance as the cause.
This is the first full year for collection of the SCIP-9 urinary catheter removal measure, so there is no way to analyze a trend. Half of Maine's hospitals reported a perfect 100% compliance rate with this infection prevention measure for an overall average of 98.5%.

MHDO has collected data for SCIP-10, perioperative temperature management, for two 12-month reporting periods. In that time, the overall state rate improved from 99.7% to 99.8%. The criteria for including this measure in this year's Near Perfect category missed by a single surgery in one hospital.

More detailed hospital performance across all outcome and process measures is displayed in the charts and tables in APPENDIX B and APPENDIX C. These two appendices provide an easy reference for identifying hospitals whose performance is at or above 95 percent compliance and where there are opportunities for continued improvement within a hospital and/or a measure.

Shortly before our release of this Report, the federal CDC released the 2014 edition of its National and State Healthcare-Associated Infections Progress Report. The numbers presented in the federal CDC's report cannot be compared to those in this report, because the two reports measure something entirely different from each other. While this report compares today's Maine infection rates to the Maine infection rates of earlier years, the CDC compares Maine's 2012 Standard Infection Ratio (SIR) to the national SIR from an earlier baseline year.

Shortly before releasing this Report, the federal CDC released the 2014 edition of its National and State Healthcare-Associated Infections Progress Report. The numbers presented in the federal CDC's report for Maine cannot be compared to those in this report, because the two reports measure something entirely different from each other. While this report compares today's Maine infection rates to the Maine infection rates of earlier years, the federal CDC compares Maine's 2012 Standard Infection Ratio (SIR) to the national SIR from an earlier baseline year.

What prevention activities are underway in Maine?

Maine was an early advocate for addressing HAIs through standardized data collection and the establishment of working partnerships with clinicians and hospitals to adopt evidence-based practices for preventing their incidence.

Hospital Patient Safety Practices and Structures

Prevention of HAIs is part of a hospital's broader effort to promote patient safety. The Leapfrog Group, a nonprofit quality-improvement organization, ranks hospitals based on its own voluntary survey and 26 measures of publicly available hospital safety data, including how often patients in a particular hospital fall, get central line-associated bloodstream infections, develop severe pressure ulcers, and have preventable complications from surgery. Rankings also assess how hospital staff perform on hand hygiene measures and if the hospital has good nursing leadership and the right level of intensive care unit staffing, as well as if it uses computerized physician order entry systems. All of Maine's hospitals

participate in this voluntary survey. In 2013, The Leapfrog Group ranked Maine first in the country for the percent of hospitals with an "A" ranking.[11]

Maine State Healthcare Associated Prevention Plan

Maine CDC began its HAI program in 2010 with federal stimulus funds. It has continued since then with some support from the federal CDC. The Maine CDC HAI program participates in monthly meetings with the Maine Infection Prevention Collaborative (see below), analyzes hand hygiene observation data for all Maine hospitals and reports findings to hospital management, has persuaded every Maine hospital to report HAI infection data to the federal CDC, offers training sessions to long term care facilities throughout the state, and has increased the capacity of pathology labs to identify and confirm C. difficile infections. Maine CDC is now cooperating with the Northeast Quality Improvement Organization to collaborate on a C. difficile reduction pilot program in the Augusta/Waterville area. Maine CDC is developing plans to increase the surveillance of HAIs, provide greater feedback to hospitals, and continue to promote "antibiotic stewardship" to encourage hospitals, physicians and patients to reduce the overuse of antibiotics, one of the key causes of antibiotic resistant infectious agents. The Maine CDC is also increasing surveillance on newly emerging and more virulent, drug-resistant disease organisms.

Maine Infection Prevention Collaborative (MIPC)

Established in 2008, the MIPC seeks to improve the health of Maine residents by preventing and controlling healthcare associated infections and the burden of drug resistant organisms. Every Maine hospital is represented on the group, which includes infection preventionists, infectious disease specialists, and key partners, including the Maine CDC, the Maine Hospital Association, the Maine Quality Forum, the Northeast Healthcare Quality Foundation and OMNE, Nursing Leaders of Maine. This past year, among other activities, the MIPC:

- supported continuation of twice annual external observation and review of hand hygiene in all Maine hospitals;
- drew attention to high turnover rates among Infection preventionists in Maine hospitals;
- provided recently trained preventionists with additional education, mentorship and a comprehensive resource manual; and
- supported the Legislature's change to Chapter 270 to simplify the reporting of HAI outcomes measures.

The MIPC's own annual report appears in APPENDIX F.

[11] "Hospital Safety Score: State Rankings", The Leapfrog Group, accessed Dec. 6, 2013 at: http://www.hospitalsafetyscore.org/state-rankings.

Maine Hospital CLABSI Validation Study

The Dirigo Health Agency contracted with the John Snow Institute of Boston to perform a detailed review and validation of the accuracy of CLABSI data collection by 12 of Maine's largest hospitals (see the full report in APPENDIX G). The study found few errors in CLABSI reporting, and provided technical feedback to the few hospitals that had made a mistake.

HAI Sub-Committee

In 2013, the Maine Quality Forum established an HAI Sub-Committee to bring together a "wide spectrum of professionals …consumers and government", to expand the partnership and engagement of multiple stakeholders within the State to design HAI-related quality improvement projects, identify quality reporting measures, and coordinate plans for public and professional education about HAIs and HAI prevention.[12]

The Subcommittee held its first quarterly meeting in June 2013 and has met twice since then. The subcommittee devoted the first two meetings to developing a common understanding of HAI-related issues facing the State, and of the wide number of existing Federal, State and local HAI prevention initiatives and activities. The members have shared their ideas and suggestions on strategies to reduce the overuse of antibiotics, creating a central HAI information repository where medical professionals and the general public could discover the full range of available programs and resources, improve communication between hospital infection preventionists and local nursing facilities, expand public education, and encourage patients and their families to speak up when they notice HAI-related risks. All subcommittee members have been encouraged to communicate with their colleagues across Maine to spread the information they've learned and to solicit suggestions and ideas.

Conclusions/Recommendations

The HAI quality indicators summarized in this report demonstrate that Maine hospitals continue to show progress in addressing the risks associated with health care associated infections. The table below reports the status of the recommendations made in last year's Annual HAI Report.

Recommendations from the 2013 Annual Report	Status
1. Continue to identify and propose new HAI measures for data collection that are evidence-based and nationally recognized.	The Maine Quality Forum worked with the Legislature to amend Chapter 270 to add the SCIP-9 measure on urinary catheter removal after surgery.

[12] See the Subcommittee's *Purpose and Charge* in Appendix D.

Recommendations from the 2013 Annual Report	Status
2. Work with the Maine Infection Prevention Collaborative (MIPC) to identify issues contributing to lack of improvement in measures with declining performance and collaborate with hospitals on improvement strategies.	Maine CDC analyzed data from five statewide external observations of hospital hand hygiene and reported results to hospital CEOs. Maine Quality Forum worked with Maine CDC and the MIPC to standardize the reporting of MRSA LabID events.
3. Collaborate with the Maine CDC to convene an HAI Sub-Committee to build broader awareness about the importance of HAI and the roles to be played by consumers, providers and policymakers.	An HAI Subcommittee was established and has held three quarterly meetings. APPENDIX D lays out the sub-committee's charge and composition.
4. Conduct a validation study of hospital reported data on CLABSI in coordination with the Maine CDC to assure consistent and reliable data collection.	The Maine Quality Forum and Maine CDC commissioned the John Snow Institute to conduct a detailed validation study of CLABSI reporting accuracy among Maine's 12 largest hospitals. See APPENDIX G for JSI's Final Report.
5. Support the ongoing prevention and surveillance efforts of the Maine CDC around HAI as described in the Maine State Healthcare Associated Prevention Plan, 2013 (see Appendix F).	In addition to its work with the HAI Subcommittee, the Maine Quality Forum plans to fund the Maine CDC's continuing validation work on hospital reporting of MRSA and C. difficile HAIs.
6. Support the Maine Infection Prevention Collaborative in achieving its objectives as set out in its 2012 Annual Report (see APPENDIX E).	Provides opportunities for data sharing and collaborates with Maine CDC to streamline the reporting of data and improving its accuracy.

New Recommendations

The Maine Quality Forum and the Maine CDC recommend the following:

1. Continue to identify, monitor, and propose new HAI measures for data collection that are evidence-based and nationally recognized.
2. Continue working with the MIPC to identify ways to improve hospital infection prevention efforts.
3. Work with the HAI Subcommittee to develop and act upon its recommendations to coordinate and broaden the scope of Maine's HAI prevention efforts. Subcommittee members have already made suggestions to create an easy-to-access web-based repository of HAI prevention advice aimed at consumers and professionals, extend the reach of anti-biotic stewardship efforts, expand HAI prevention efforts and training in long term care facilities, and others.
4. Continue to support Maine CDC's ongoing prevention and surveillance efforts of the Maine CDC around HAI as described in the Maine State Healthcare Associated Prevention Plan, 2013.

5. Continue to work with the Maine CDC to support the work of the Maine Infection Prevention Collaborative. Continue to have Maine CDC:
   - Update each MIPC meeting on the State's current HAI activities and also supported and helped new hospital Infection Preventionists; and
   - Help new hospital Infection Preventionists learn how to accurately submit HAI data to the federal CDC's National Health Safety Network.
6. Cooperate with the Maine Health Data Organization to make HAI quality indicator results more publicly available through the redesign of MHDO's website.

Appendix A: Maine hospitals listed by hospital peer group July 2012 to June 2013

The Maine hospital peer groups were created by the Maine Hospital Association to facilitate comparisons between similar hospitals.

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 Medical Center ..... 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
Goodall Hospital ..... Sanford

Peer Group D

Maine Coast Memorial Hospital..... Ellsworth
Inland Hospital..... Waterville
Miles Memorial Hospital ..... Damariscotta
Northern Maine Medical Center..... Fort Kent
Parkview Adventist Medical Center ..... Brunswick

Peer Group E

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
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 Hospital ..... Pittsfield
St Andrews Hospital & Healthcare Center ..... Boothbay Harbor
Stephens Memorial Hospital..... Norway
Waldo County General ..... 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 intensive care unit central line days (HAI-1).
- Number of catheter-related blood stream infections among neo-natal intensive care unit patients per 1,000 central line catheter or umbilical days (HAI-2).
- Compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care units (HAI-3).
- 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. Surgical site infections (SSI)

- Percent of all patients receiving an antibiotic within one hour prior to any surgery (SCIP-1A).
- Percent of all surgery patients receiving the recommended antibiotic for their procedure (SCIP-2A).
- Percent of all surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended (SCIP-3).
- Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose (SCIP-4).
- Percent of surgical patients whose urinary catheter was removed on postoperative day I or postoperative day 2 (SCIP-9)
- Percent of surgery patients with perioperative temperature management (SCIP-10).

III. Ventilator associated pneumonia (VAP)

- Percent documented compliance with pneumonia prevention measures among ICU patients on ventilators (HAI-5).

IV. Methicillin-resistant Staphylococcus aureus (MRSA)

- MRSA rates per thousand patient days.

V. C. difficile

- Maine hospital onset and community-onset healthcare facility associated C. difficile rate per 10,000 patient days.

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

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

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

HAI-4: 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. Newborns can also have central lines, but these lines usually enter the body through the umbilical cord.

A central line associated bloodstream infection (CLABSI) is defined as an infection in the bloodstream that occurs after a central line has been placed in a patient and is unrelated to any infections the patient had previously. 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 point out some deficiencies that need to be corrected, especially given that CLABSI is a relatively rare event in healthcare settings.

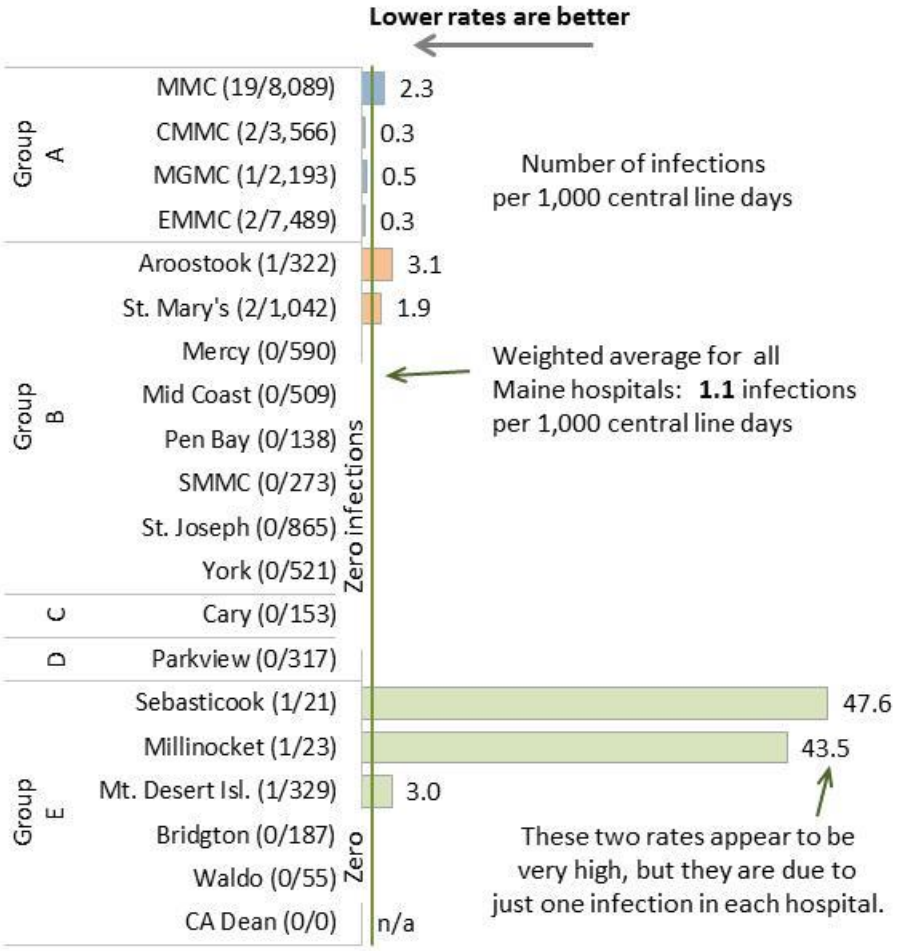
The use of central lines to deliver medications and to monitor how well a patient's body is functioning is an important tool available to health care providers. But because central line bloodstream infections result in risk of morbidity and mortality to patients and because they result in longer and more costly hospital stays, it is important to take steps to effectively and efficiently reduce their incidence.

Clinicians and researchers have studied CLABSI carefully and have developed strategies designed to lower the risk of infection that goes along with the placement of a central line. These strategies have been grouped into "bundles" of best practices – practices that will reduce the risk of infection before insertion of the central line, the strategies to reduce risk at the time of insertion, and strategies to minimize the risk of infection after insertion.[13] There are standard definitions for these bundles of best practices, 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 removal of 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.

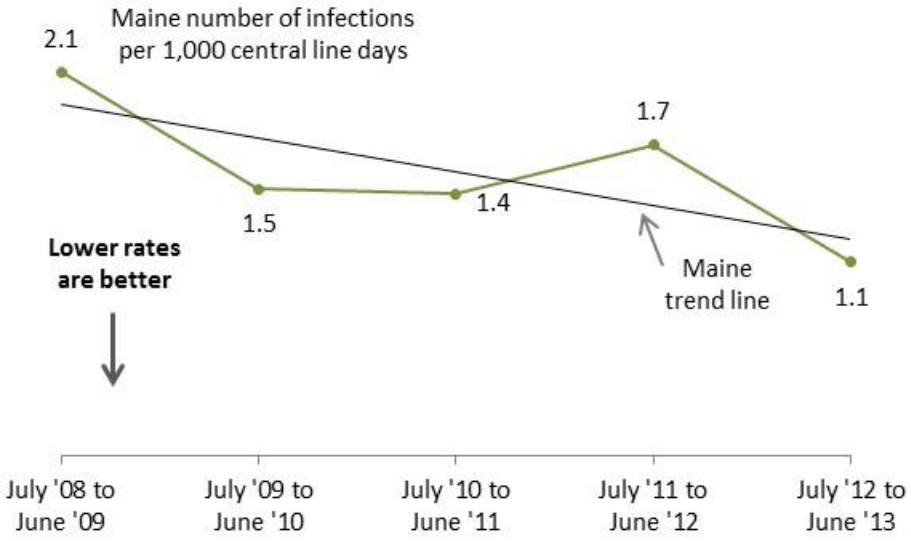
[13] Strategies to prevent central line-associated bloodstream infections in acute care hospitals. National Guideline Clearing House. Agency for Healthcare Research & Quality, US Department of Health and Human Services. http://www.guideline.gov/content.aspx?id=13395

HAI-1: Number of central line catheter-associated blood stream infections among intensive care unit (ICU) patients per 1,000 central line days, for Maine hospitals that reported at least one infection in the past five years, by hospital peer groups, July 2012 to June 2013
The numerators (number of infections) and denominators (number of catheter days) are in parentheses.

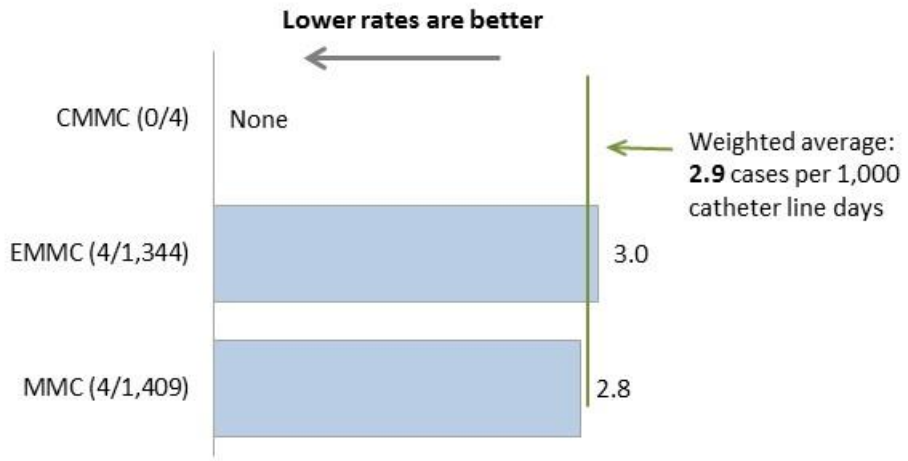
Although the rates for Sebasticook and Millinocket appear to be very high, both hospitals had only one CLABSI infection each. Because the number patient days were so small, 47.6 per 1,000 and 43.5 per 1,000 respectively, the difference between their rates and the state average were not statistically significant. In other words, there's not enough data to tell us whether other hospitals are doing more than they are to prevent CLABSIs, or if it's only a matter of random chance that one of these events occurred in their hospital instead of somewhere else.



HAI-1: The annual weighted average rate for central line catheter-associated blood stream infections (CLABSI) per 1,000 intensive care unit central line days for all Maine hospitals from July 2008 to June 2013 improved by about 0.2 fewer infections per 1,000 patient days each year.

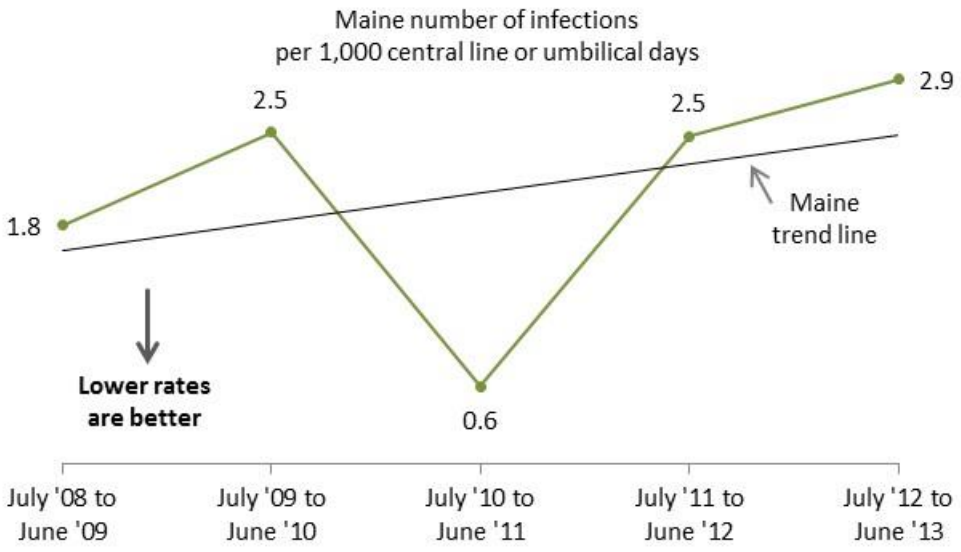


HAI-2: Number of catheter-related blood stream infections among high-risk nursery patients per 1,000 central-line or umbilical catheter days, for the three Maine hospitals that have neo-natal intensive care units (NICU), July 2012 to June 2013. Although the data is collected by five different birth weight categories, there are too few cases to measure any meaningful difference between them.
The numerators (number of infections) and denominators (number of catheter days) are in parentheses.

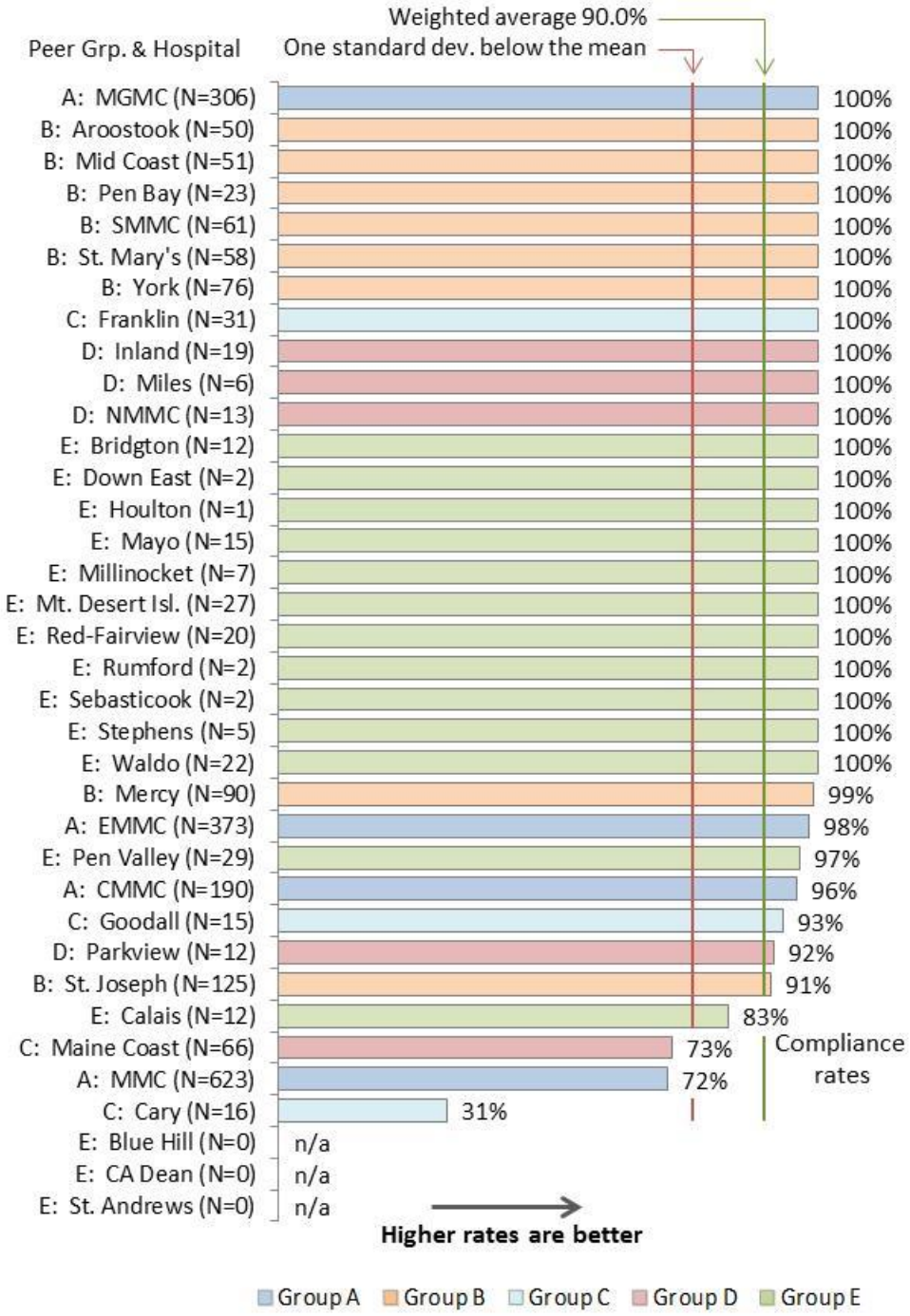


HAI-2: Number of catheter-related blood stream infections (CLABSI) among neo-natal ICU patients per 1,000 central-line catheter or umbilical days by Maine hospitals with neo-natal ICU's from July 2008 to June 2013.

While the difference between the statewide average for the 2012-13 reporting period (2.9 per 1,000 days) and the 2010-11 reporting period (0.6 per 1,000 days) was statistically significant, the difference between 2012-13 and any of the other three years was not.

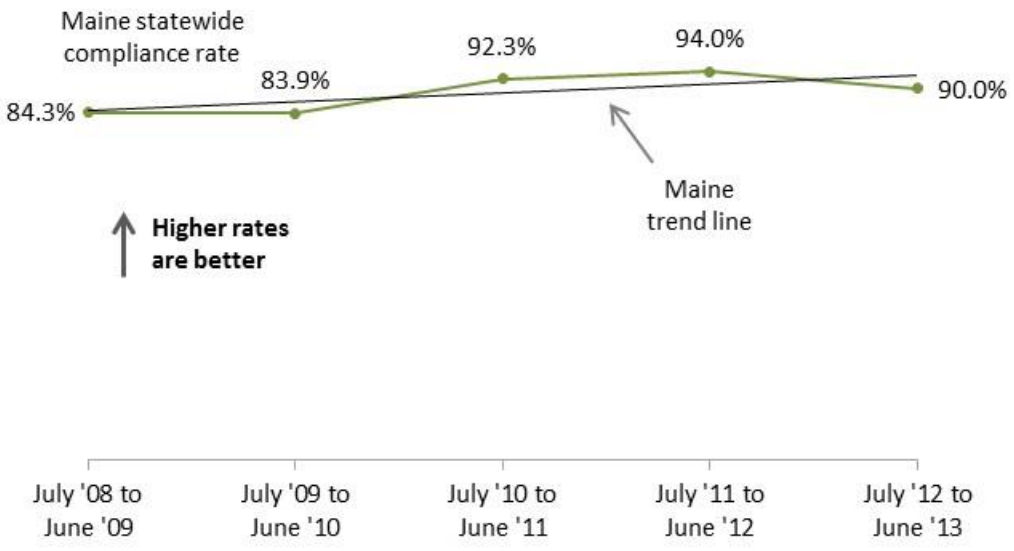


HAI-3: Percent compliance with all five evidence-based interventions for patients with intravascular central line catheters (central line bundle compliance) in intensive care units among Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients with central line catheters.)

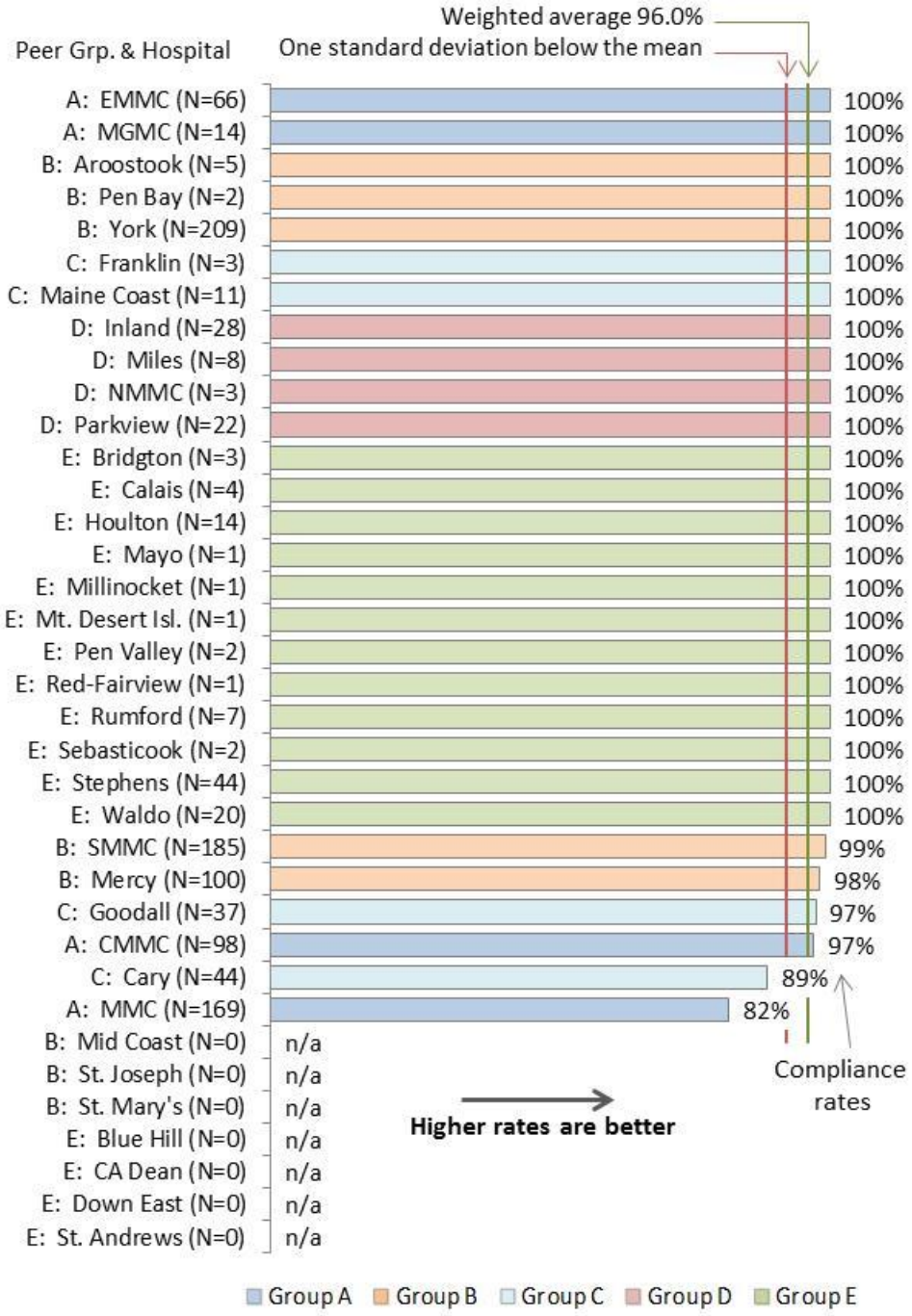


Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. Hospitals with a rate of "n/a" reported having no patients who fit this category from July 2012through June 2013.

HAI-3: The annual weighted average percent compliance with all five evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) in intensive care units across all Maine hospitals, July 2008 through June 2013.

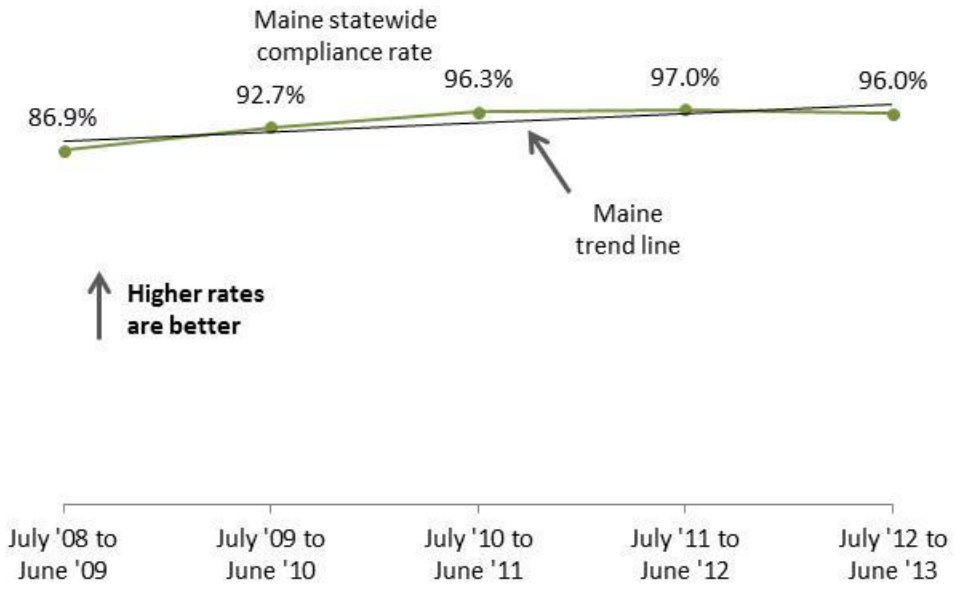


HAI-4: Percent compliance with the four insertion-related, evidence-based interventions for patients with intravascular central catheters (central line bundle compliance) placed preoperatively, in pre-operative areas, operating rooms, and recovery areas by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of central line catheter insertions.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. Hospitals with a rate of "n/a" reported having no patients who fit this category from July 2012through June 2013.

HAI-4: The annual weighted average percent 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 across all Maine hospitals, July 2008 through June 2013



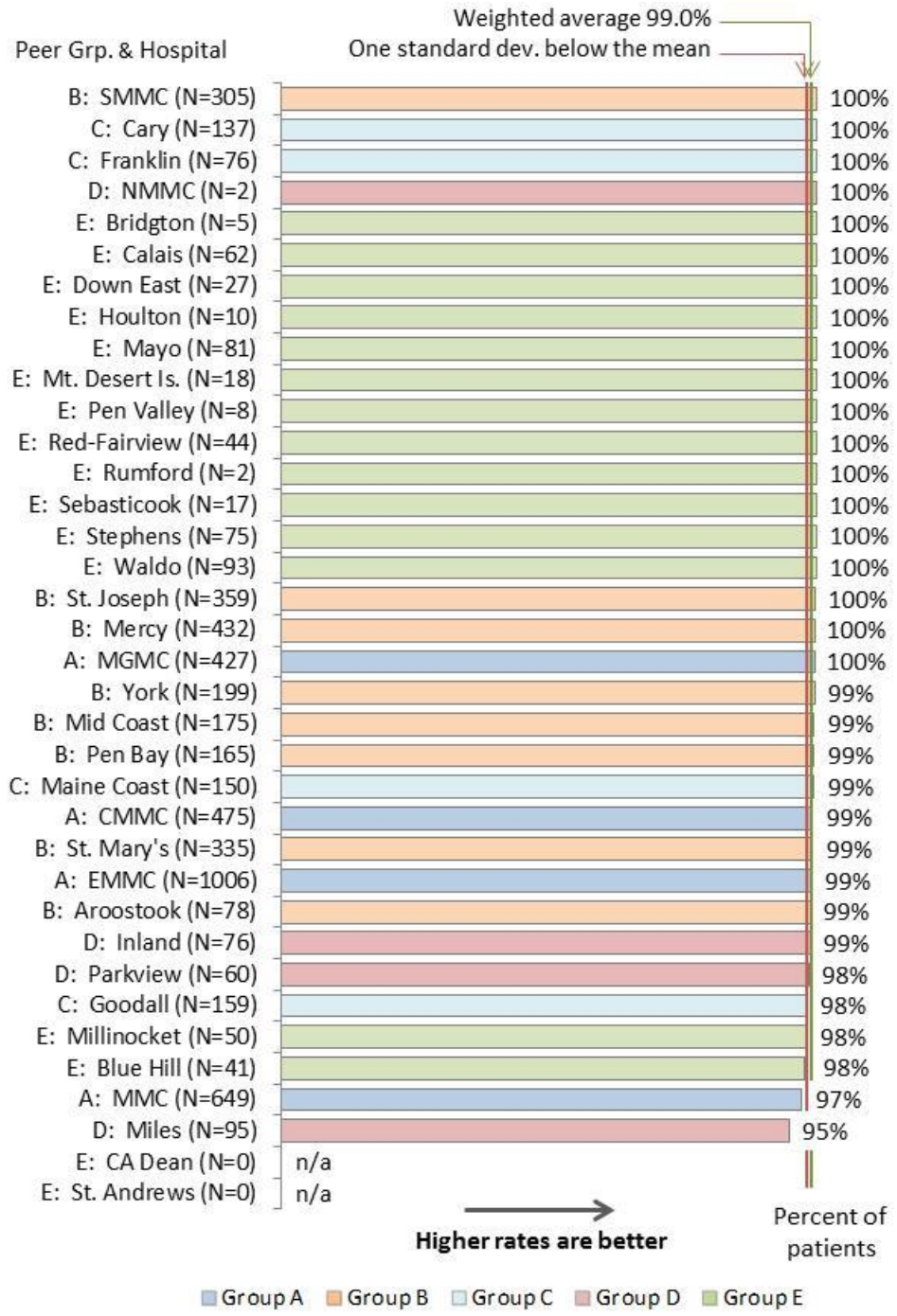
Surgical site infections (SSI)

SCIP-1A: Percent of all patients receiving an antibiotic within one hour prior to any surgery

Antibiotics are drugs that kill bacteria that can cause infection. Medical research has shown that antibiotics are most effective in reducing the risk of infection when they are given to the patient as close to surgery time as possible and not more than one hour prior to surgery.[14] The first SCIP measure looks at the percent of surgical patients in Maine hospitals who received an antibiotic within one hour prior to surgery – more specifically, within one hour prior to the first incision. This measure reports on how well each hospital adheres to a specific process of care that is considered to be the best, evidence-based care.

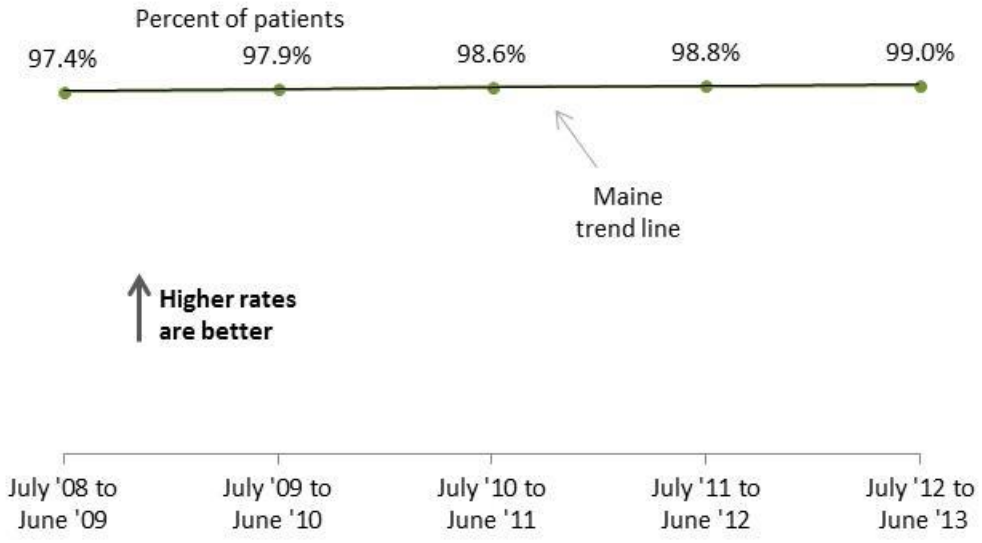
[14] Note that there are some prophylactic antibiotics used that require a slow infusion of the drug; some such drugs may take longer to act than others. These drugs will be appropriately administered more than one hour prior to surgery, to allow time for proper infusion. Not all patients will receive an antibiotic before surgery as some types of operations do not require pre-surgical antibiotics.

SCIP-1A: Percent of all patients receiving an antibiotic within one hour prior to any surgery, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients who had surgery.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. St. Andrews hospital reported having had no patients in this category during July 2012 through June 2013.

SCIP-1A: The annual weighted average percent of all patients receiving an antibiotic within one hour prior to any surgery, across all Maine hospitals, July 2006 through June 2013.

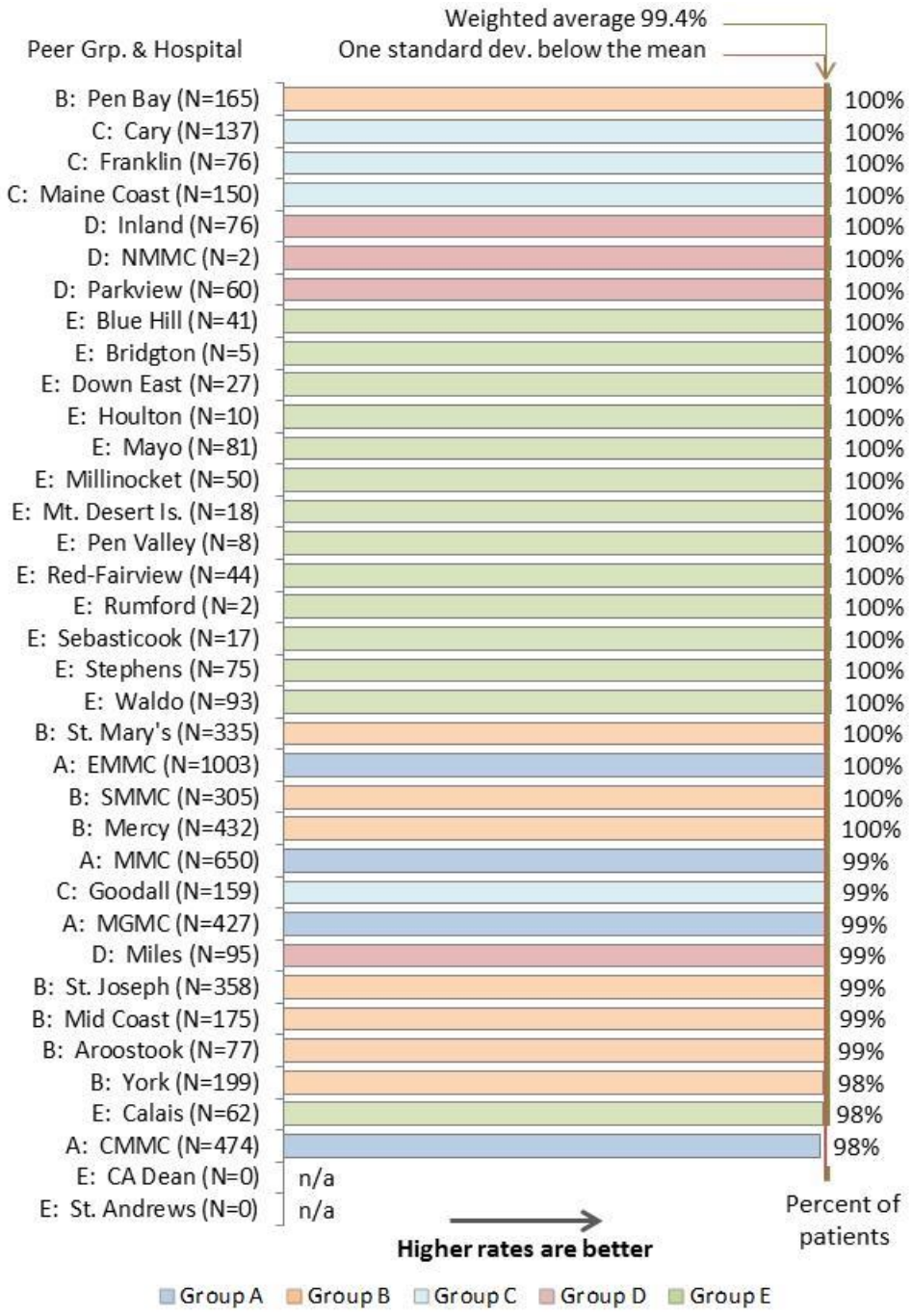


SCIP-2A: Percent of all surgery patients receiving the recommended antibiotic for their procedure

The second SCIP measure looks at how often an appropriate prophylactic antibiotic was chosen based on national guidelines. It is important to give the right drug at the right time. When preparing the patient for surgery, doctors should choose an antibiotic that medical evidence has shown to be effective at preventing infection in similar patients under similar conditions.

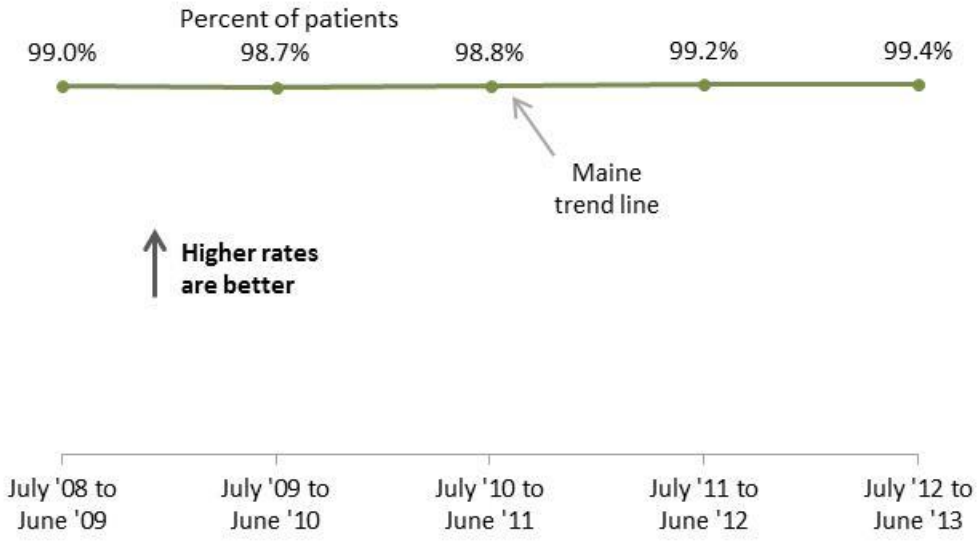
It is important for surgical patients to receive prophylactic antibiotics that are consistent with current clinical guidelines specific to each particular type of surgical procedure. While one drug might be best for patients about to undergo a hip replacement, a different drug may be indicated for use in patients about to have heart surgery. The goal is to use an antibiotic that is both safe for the patient and cost effective. At the same time, the drug chosen must be able to fight off the infections the patient is most likely to face.

SCIP-2a: Percent of all surgery patients receiving the recommended antibiotic for their procedure, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients who had surgery.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. St. Andrews hospital reported having had no patients in this category during July 2012 through June 2013.

SCIP-2a: The annual weighted average percent of all surgery patients receiving the recommended antibiotic for their procedure, across all Maine hospitals, July 2006 through June 2012

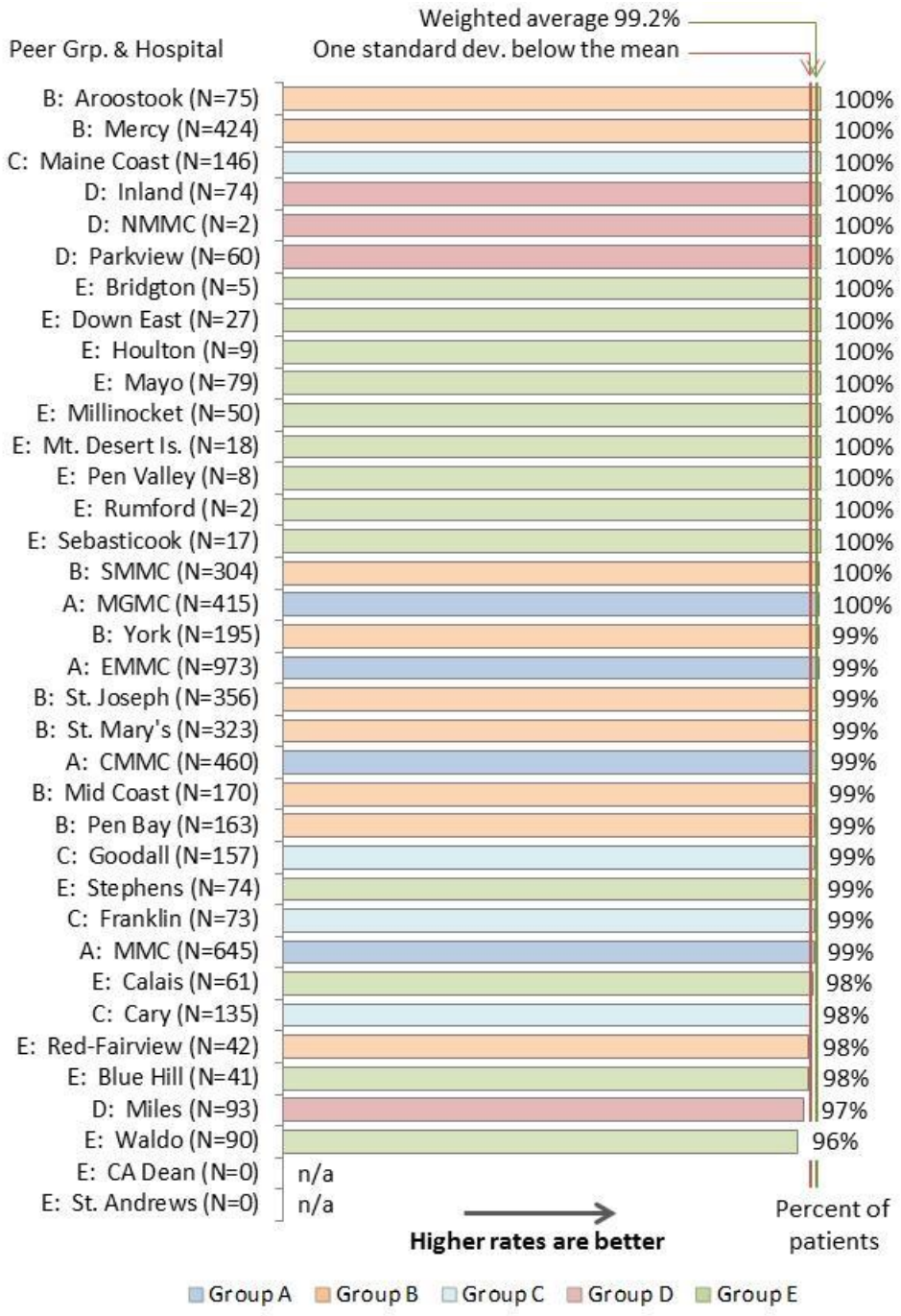


SCIP-3: Percent of all surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended

Just as it is important to give the right antibiotic to the right patient at the right time, it is also important to stop that antibiotic when it will no longer provide a meaningful benefit to the patient. Continuing prophylactic antibiotics for more than 24 hours after surgery ends does not provide added benefit.[15] In fact, prolonged administration of the antibiotic can sometimes heighten the risk of a patient getting certain infections and can contribute to the development of bacteria with greater resistance to antibiotics.

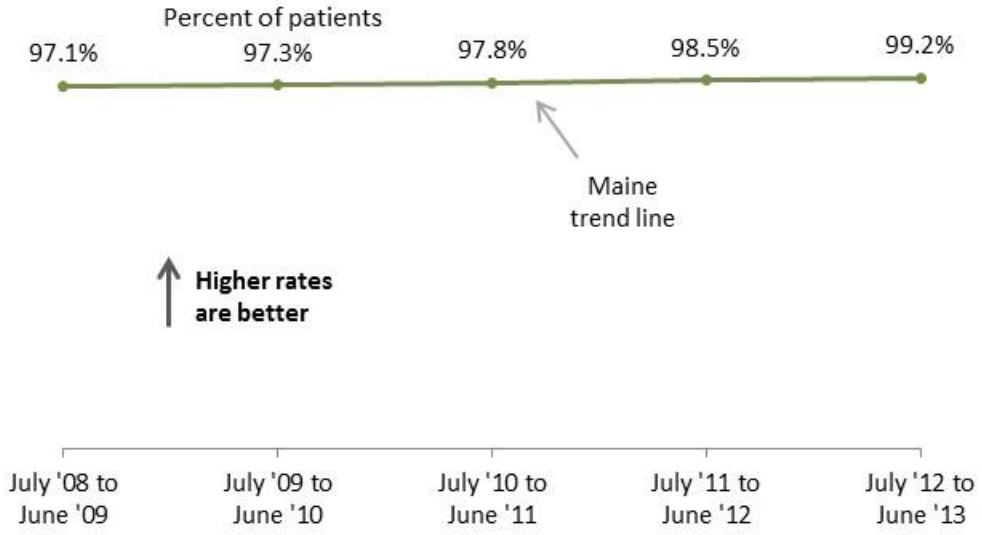
[15] Sometimes doctors may prescribe an antibiotic for a post-surgical patient for a number of reasons, such as signs of infection.

SCIP-3: Percent of all surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients who had surgery.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. St. Andrews hospital reported having had no patients in this category during July 2012 through June 2013.

SCIP-3: The annual weighted average percent of all surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended, across all Maine hospitals, July 2006 through June 2013.

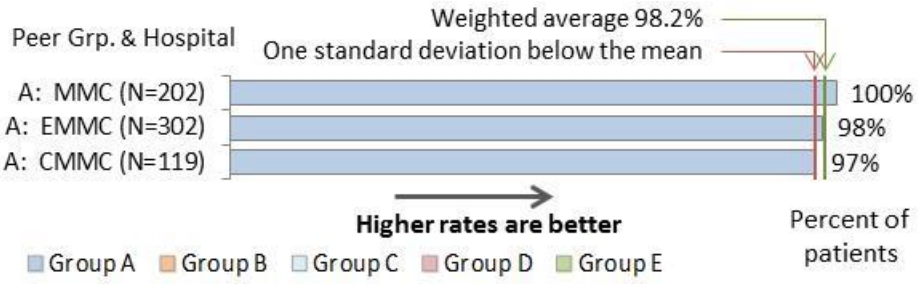


SCIP-4: Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose

Hyperglycemia – high blood sugar – has been associated with increases in both morbidity and mortality in surgical patients, especially for patients undergoing heart surgery. This occurs in both diabetic and non-diabetic patients. As the level of hyperglycemia increases, so does a patient's risk of infection. It is important to identify hyperglycemia so that steps can be taken to minimize the risk of infection and the risk of a poor outcome for heart surgery patients.

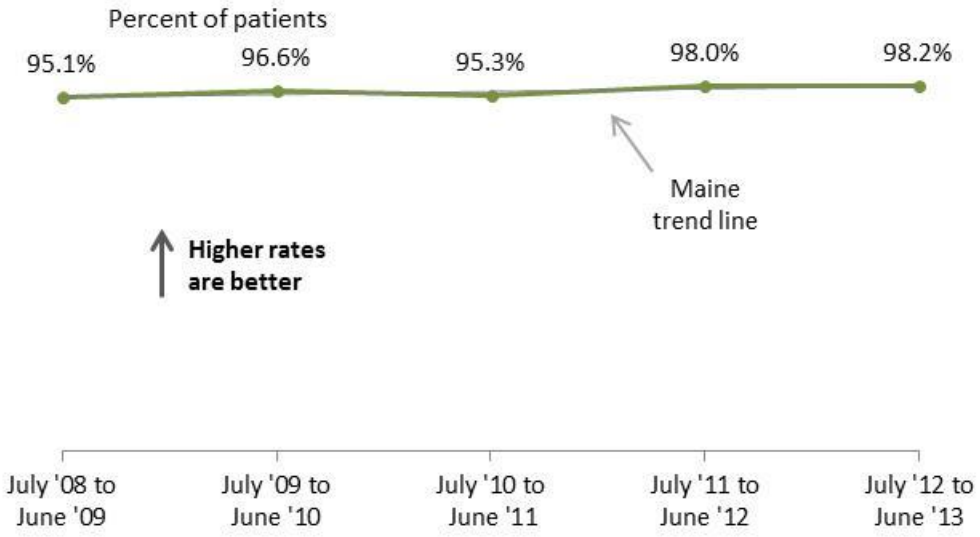
The charts below show how well Maine hospitals are doing with regard to checking and controlling levels of blood sugar in patients after heart surgery. There are only three hospitals in Maine that perform heart surgery and each hospital's performance is shown over three years.

SCIP-4: Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients who had cardiac surgery.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name.

SCIP-4: The annual weighted average percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose, across all Maine hospitals, July 2008 through June 2013

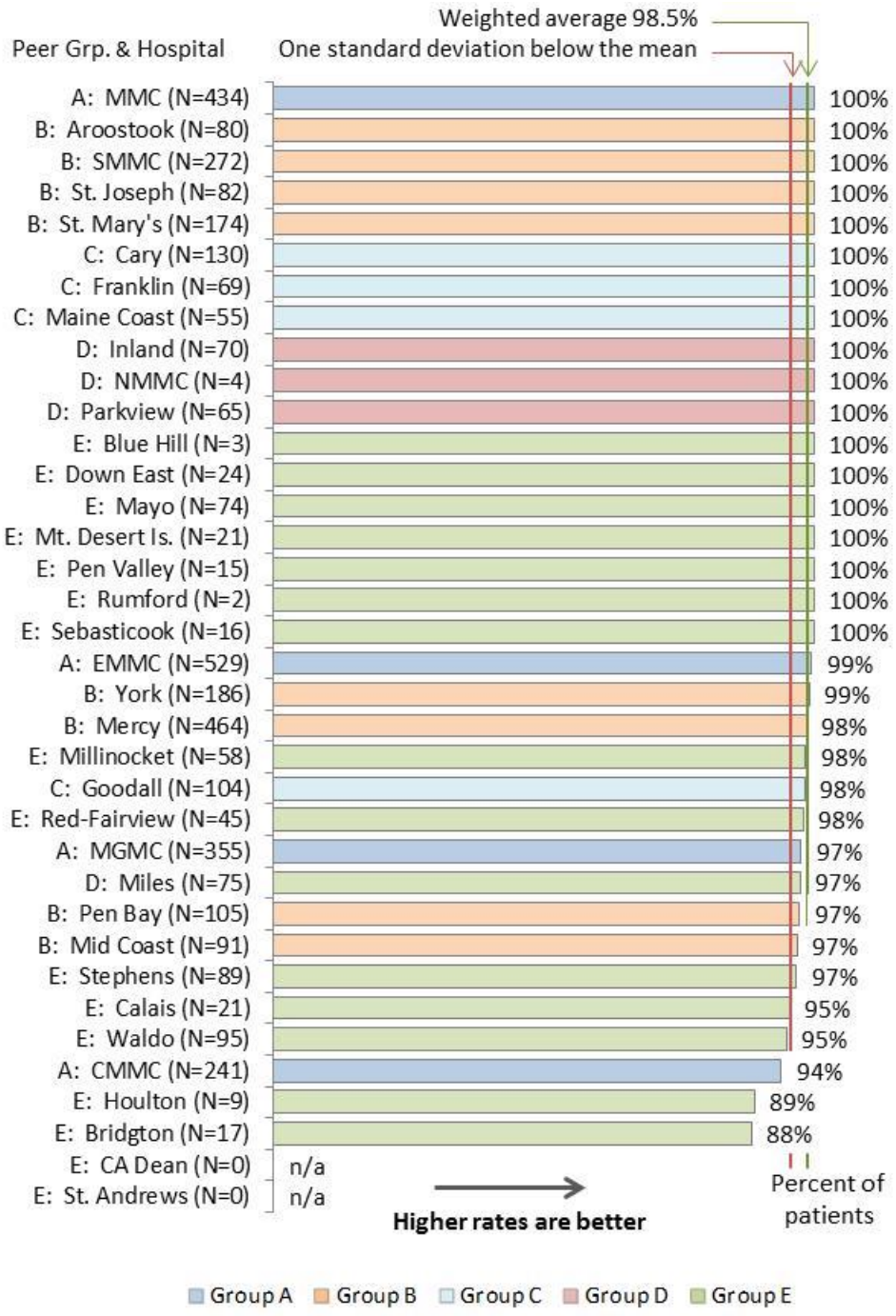


SCIP-9: Percent of surgical patients whose urinary catheter was removed on postoperative day I (POD 1) or postoperative day 2 (POD 2)

Patients who have a urinary catheter left in place more than two days after surgery have twice the risk of developing a urinary tract infection (UTI), compared to surgical patients with urinary catheters that had been removed within two days. Failure to remove the catheter within two days also increases the risk of re-hospitalization for a UTI[16].

[16] Agency for Healthcare Research and Quality (AHRQ) National Quality Measures Clearinghouse SCIP-inf-inf-9 "Measure Summary" web page, accessed at http://www.qualitymeasures.ahrq.gov/content.aspx?id=35534 on Jan. 31, 2014.

SCIP-9: Percent of surgical patients whose urinary catheter was removed on postoperative day I (POD 1) or postoperative day 2 (POD 2), by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of surgery patients who had a urinary catheter.)

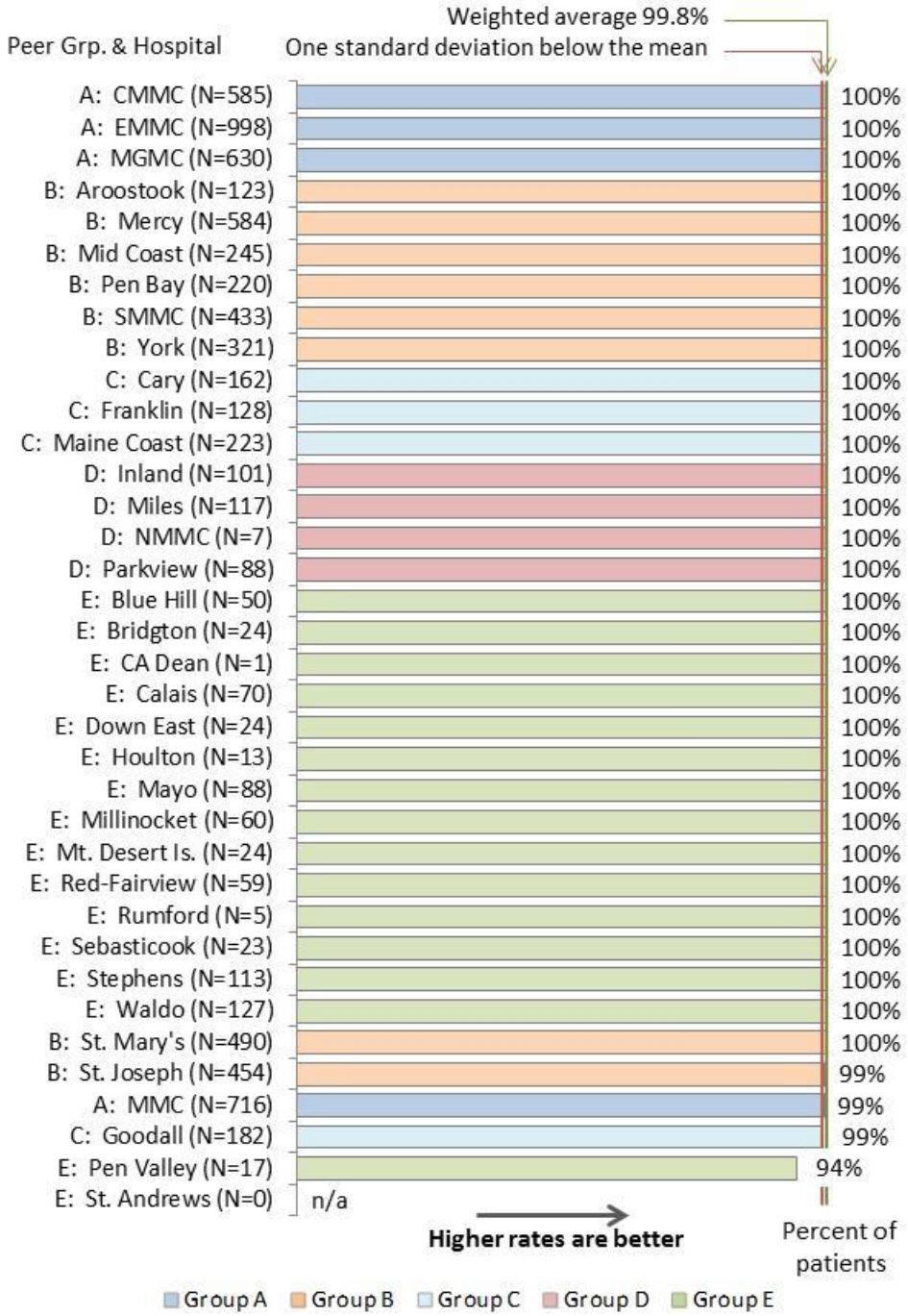


Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. Hospitals with a rate of "n/a" reported having no patients who fit this category from July 2012through June 2013.

SCIP-10: Percent of surgery patients with perioperative temperature management

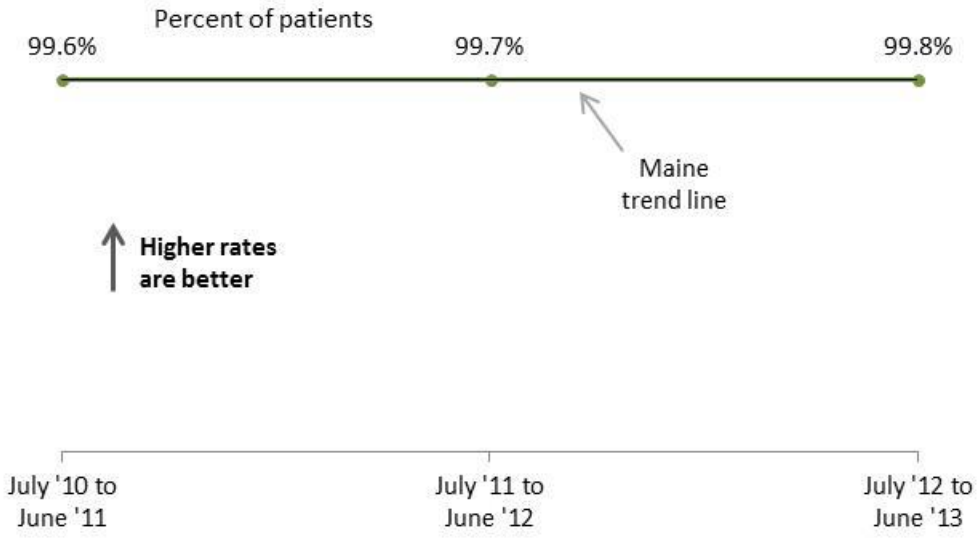
To improve surgical outcomes and reduce risk of complications, hospitals use active warming methods to achieve a temperature of 36°C before, during and after surgery. This process measure calculates the percentage of surgical patients who received proper active warming within 30 minutes before or 15 minutes after administration of anesthesia.

SCIP-10: Percent of surgery patients with perioperative temperature management, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of surgery patients.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name. St. Andrews hospital reported having had no patients in this category during July 2012 through June 2013.

SCIP-10: Percent of surgery patients with perioperative temperature management, across all Maine hospitals, July 2010 through June 2013



Ventilator associated pneumonia (VAP)

HAI-5: Percent documented compliance with pneumonia prevention measures among ICU patients on ventilators

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 pneumonia; when the pneumonia occurs after the patient has been on mechanical ventilation it is referred to as "VAP" or ventilator associated pneumonia. VAP occurs about 20 percent of the time in patients on mechanical ventilation and can lead to increased severity of illness, greater risk of death, and longer, more expensive hospital stays.[17]

The risk for VAP 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).

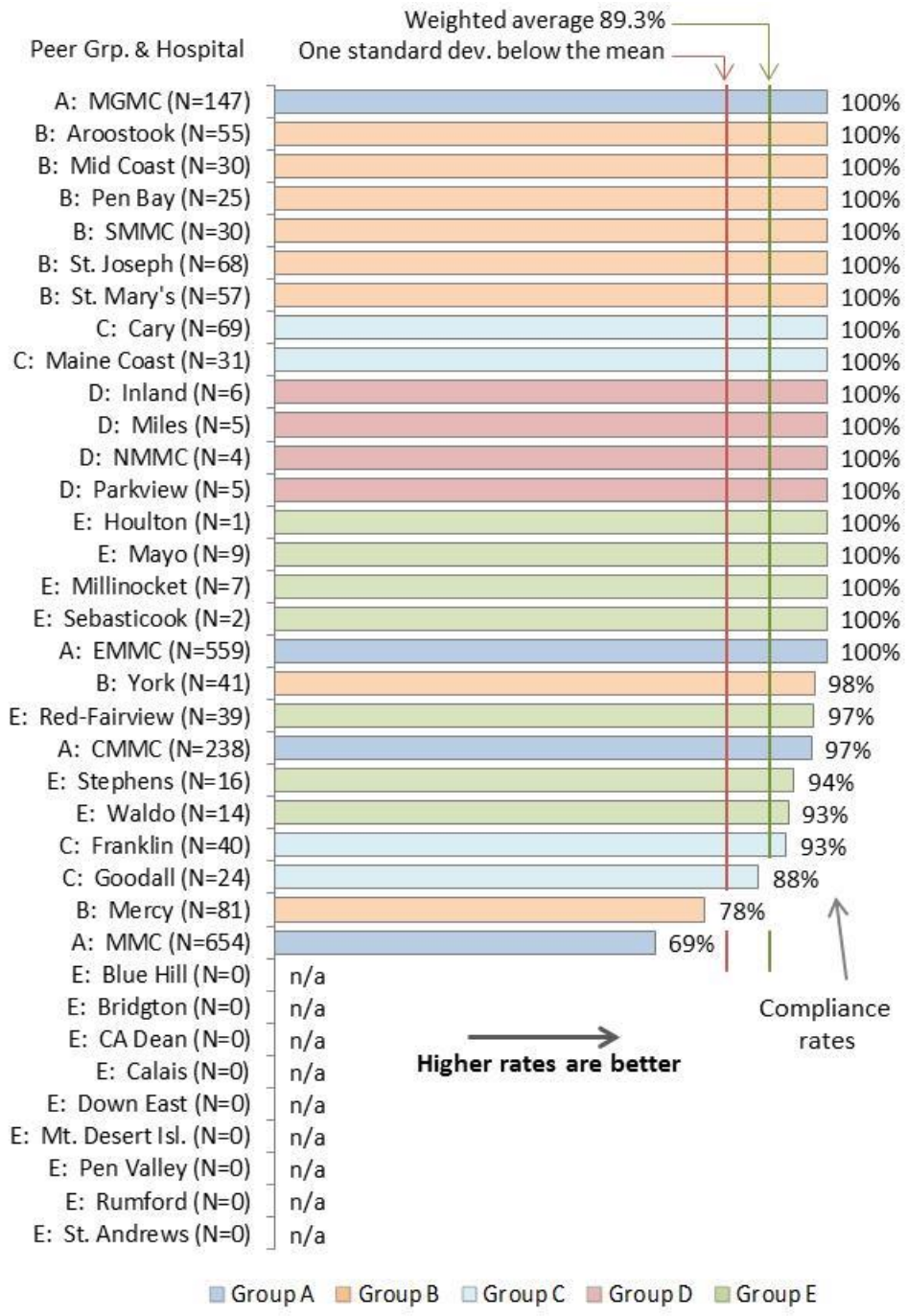
[17] Koenig SM and Truwit JD. Ventilator-associated Pneumonia: Diagnosis, Treatment and Prevention. Clin Microbiol Rev. 2006 October; 19(4): 637–657. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1592694/

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. Poor hand hygiene in care workers is the most significant personnel-related factor in the risk of VAP.

Research has found that there are practices that can reduce the risk of VAP. When these practices are bundled and used together, they produce even better outcomes than if any one of them were used alone. The VAP 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.

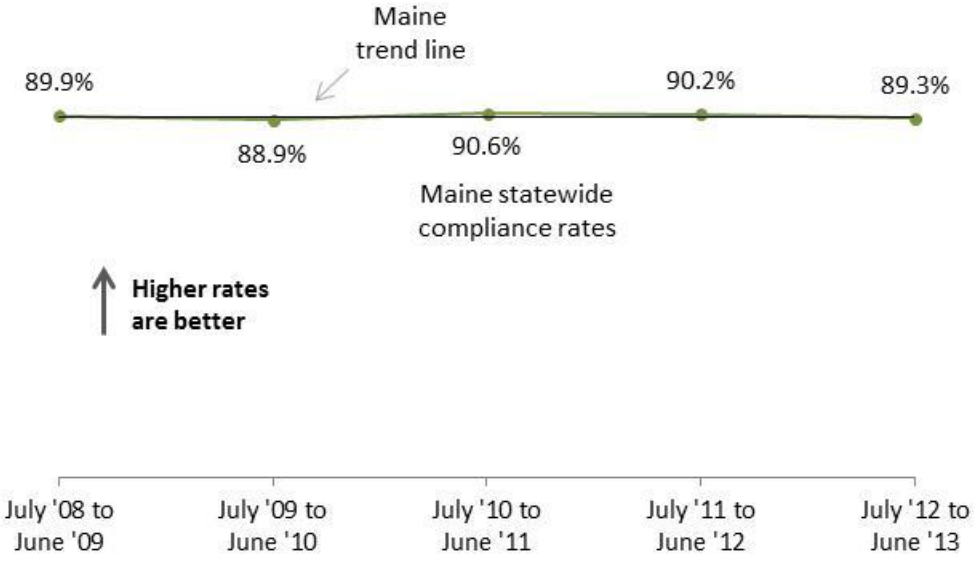
The charts below show, by peer group for each Maine hospital, the degree of adherence to the use of VAP preventive protocols.

HAI-5: Documented pneumonia prevention measures among ICU patients on ventilators, by Maine hospitals designated by peer group, July 2012 through June 2013. ("N" represents the number of patients with a ventilator.)



Note: Hospitals sorted by compliance rate, then by Peer Group, and within Peer Groups, alphabetically by name Hospitals with a rate of "n/a" reported having no patients who fit this category from July 2012through June 2013.

HAI-5: The annual weighted average percent documented compliance with pneumonia prevention measures among ICU patients on ventilators, across all Maine hospitals, July 2008 through June 2013



Methicillin-resistant Staphylococcus aureus (MRSA)

Methicillin-**r**esistant ***S**taphylococcus **a**ureus* – or MRSA, as it is commonly called, is a type of bacteria that can cause infection in human beings. "Regular" strains of staphylococcus aureus bacteria are often resistant to the effect of penicillin and other related drugs, but the antibiotic Methicillin is usually able to address a staph infection. However, over time, some strains of staph have developed that also resist the effect of Methicillin and similar drugs; these bacteria are referred to as MRSA. Because this type of bacterial infection is able to resist so many antibiotics, it is difficult to treat.

MRSA can be found both in the general community and in health care. A person can carry MRSA 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 infect the bloodstream, the urinary tract and even the lungs.

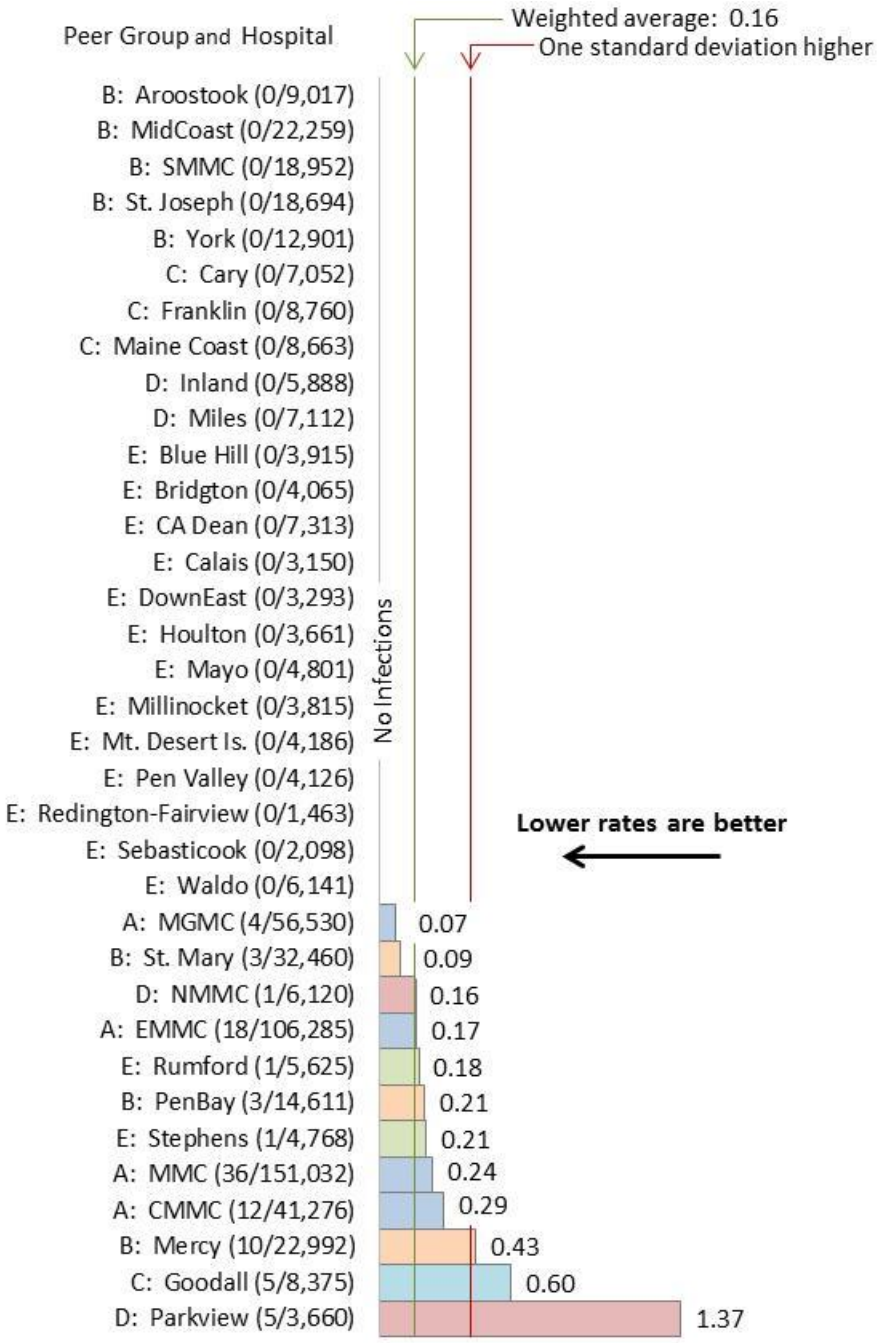
Much of the time, MRSA infections are not life threatening, but when a person is already weakened by illness or surgery – such as people in hospitals or nursing facilities – MRSA can cause more complicated illness, increasing risk of death. MRSA infections can also increase costs because of longer hospital stays and greater health care utilization. As this bacterium becomes more and more difficult to treat, concern among health care workers, public health officials and lawmakers about the increasing rate of MRSA infection is growing.

The incidence of hospital acquired MRSA infections reported by Maine hospitals to the federal CDC's National Health Safety Network (NHSN), and presented here is a quality indicator that can help show how well infection control efforts are working at a health care facility. This incidence data, though, does not differentiate between MRSA infections that developed in individuals known to have previously been colonized with MRSA, and those whose MRSA is the result of a new infection.

NOTE: Next year, to simplify and reduce the reporting burden on hospitals, we plan to switch to measuring the rate of MRSA infections by collecting data on Laboratory ID Events. LabID is proxy measure that can overstate the number of MRSA HAIs, because it may not accurately distinguish between MRSA infections that occurred within the hospital and MRSA colonization (positive MRSA cultures without obvious infection). While not as rigorously precise as the counting method used for this year's report, LabID event is still recognized by the federal CDC as a valid way to compare infection rates between hospitals that use LabID. *(See Appendix H for more information.)*

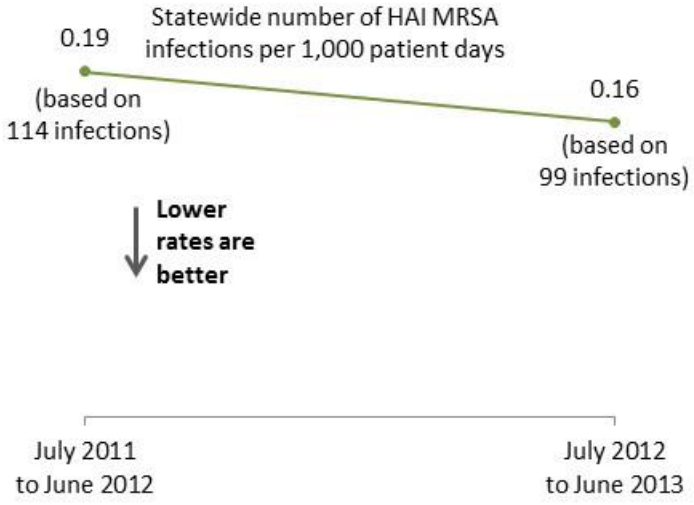
MRSA: Maine Hospital MRSA HAI Rates per 1,000 Patient Days for July 2012 to June 2013, by hospital peer groups Numerators (infections) and denominators (number of patient days) are in parentheses.

Although Parkview Hospital's rate appears to be high, the number of infections was too small for the difference between their rate and the statewide average to have been statistically significant. In other words, there's not enough data to tell whether other hospitals are doing more than Parkview to prevent MRSA, or if the difference in rates was due to random chance.



Note: To simplify and reduce the reporting burden on hospitals, Maine CDC will start collecting MRSA data based on laboratory identified cases, beginning with data collection for the 2015 Annual Report.

MRSA: The statewide number of MRSA HAI infections per 1,000 patient days in Maine hospitals, July 2011 to June 2013. Maine hospitals had 15 fewer MRSA infections than in the previous 12-month reporting period.



C. difficile

The once easy-to-treat *Clostridium difficile ("C. difficile")* bacteria that causes diarrhea, fever, loss of appetite, nausea and belly pain and tenderness have now become drug-resistant, and sometimes fatal. In the just the seven years between 1997 and 2004, the death rate C. difficile infections rose from 1.5% to 6.9%.[18]

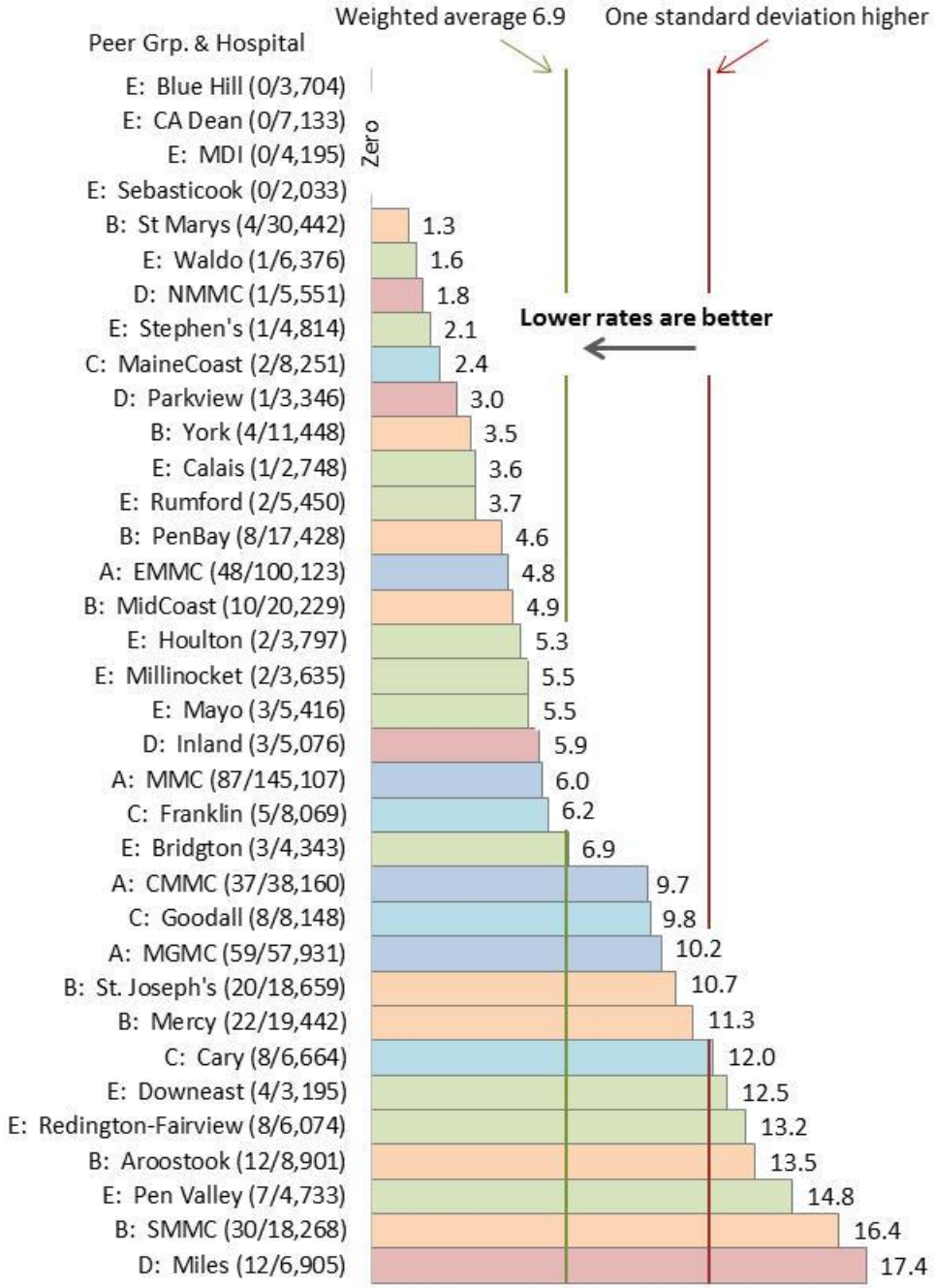
Most cases occur in people on antibiotics; therefore, people already sick, those recovering from surgery and the elderly are at increased risk. C. difficile spores live for a very long time and have developed resistance to most disinfectants. They can be found on everyday items like bed linens and medical 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 medical providers to wash their hands between seeing patients.

The number of cases of C. difficile infections continues to rise across the country, as it has in Maine. The Maine CDC has now been collecting and validating healthcare associated C. difficile infection data from all Maine hospitals for the past two years. Between the two most recent 12-month reporting periods the number of hospital-associated C. difficile infections in Maine rose by 4% from 398 to 415, while the rate per 10,000 patient days increased from 6.6 to 6.9. C. difficile HAIs were identified in 31 Maine hospitals during the most recent 12-month reporting period, compared to only 13 hospitals for the most recent reporting period for MRSA HAIs.

LabID is proxy measure that can overstate the number of MRSA HAIs, because it may not accurately distinguish between infections that occurred within the hospital where they were discovered and infections that occurred elsewhere.

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

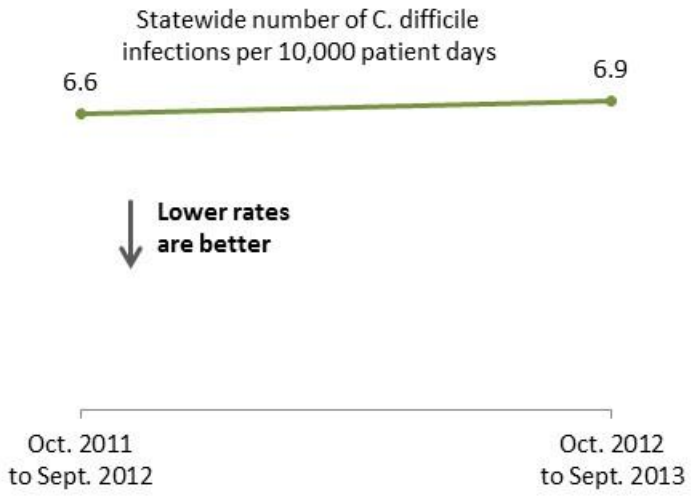
C. difficile: Hospital onset and community-onset healthcare facility associated (CO-HCFA)[19] C. difficile rate per 10,000 patient days[20] for October2012 through September 2013. Numerators (infections) and denominators (number of patient days) are in parentheses.



[19] Cases are categorized as "hospital onset" if first identified in a sample taken more than 3 days after hospital admission. If C. difficile is identified in a sample from an outpatient setting or during the first 3 days of a hospital stay, and if the patient had a documented hospital admission within the previous 4 weeks, then the case belongs to the "community-onset healthcare facility associated" category.

[20] The reader should note that MRSA and C. difficile rates are traditionally measured on different scales. MRSA infections are measured in cases per 1,000 patient days, while C. difficile is measured in cases per 10,000 patient days.

C. difficile: Statewide number of hospital onset and community-onset healthcare facility associated (CO-HCFA)[21] C. difficile rate per 10,000 patient days for October 2012 through September 2013



The reader should note that MRSA and C. difficile rates are traditionally measured on different scales. MRSA infections are measured in cases per 1,000 patient days, while C. difficile is measured in cases per 10,000 patient days.

[21] Cases are categorized as "hospital onset" if first identified in a sample taken more than 3 days after hospital admission. If C. difficile is identified in a sample from an outpatient setting or during the first 3 days of a hospital stay, and if the patient had a documented hospital admission or long term care stay within the previous 12 weeks, then the case belongs to the "community-onset healthcare facility associated" category.

Appendix C: Outcomes and performance measures

1. Summary of Maine Hospital HAI Outcomes Measures, July 2012 to June 2013

The following table displays hospital infection rates for five Healthcare Acquired Infection (HAI) measures Appendix A. For all four measures, lower infection rates are better.

Peer Group	Hospital	Number of infections per:			
		1,000 central line days		1,000 patient days	10,000 patient days
		HAI-1 CLABSI (ICU)	HAI-2 Neonatal ICU	MRSA	C. difficile
A	CMMC	0.6	0.0	0.29	9.7
	EMMC	0.3	3.0	0.17	4.8
	MGMC	0.5	n/a	0.07	10.2
	MMC	2.3	2.8	0.24	6.0
B	Aroostook	3.1	n/a	0.00	13.5
	Mercy	0.0		0.43	11.3
	Mid Coast	0.0		0.00	4.9
	Pen Bay	0.0		0.21	4.6
	SMMC	0.0		0.00	16.4
	St. Joseph's	0.0		0.00	10.7
	St. Mary's	1.9		0.09	1.3
	York	0.0		0.00	3.5
C	Cary	0.0	n/a	0.00	12.0
	Franklin	0.0		0.00	6.2
	Goodall	0.0		0.60	9.8
	Maine Coast	0.0		0.00	2.4
D	Inland	0.0	n/a	0.00	5.9
	Miles	0.0		0.00	17.4
	NMMC	0.0		0.16	1.8
	Parkview	0.0		1.37†	3.0
E	Blue Hill	n/a	n/a	0.00	0.0
	Bridgton	0.0		0.00	6.9
	CA Dean	n/a		0.00	0.0
	Calais	0.0		0.00	3.6
	Down East	0.0		0.00	12.5
	Houlton	0.0		0.00	5.3
	Mayo	0.0		0.00	5.5
	Millinocket	43.5†		0.00	5.5
	Mt. Desert Is.	3.0		0.00	0.0
	Pen Valley	0.0		0.00	14.8
	Red-Fairview	0.0		0.00	13.2
	Rumford	0.0		0.18	3.7
	Sebasticook	47.6†		0.00	0.0
	St. Andrews	n/a		n/a	n/a
	Stephens	0.0		0.21	2.1
	Waldo	0.0		0.00	1.6
Statewide average		1.1	2.9	0.16	6.9

n/a = hospital did not have any patients to whom the measure applied

† While these hospital rates seem high, the number of cases was so few (as few as 1) that statistical tests cannot rule out random chance as the difference between those rates and the state average.

2. Summary of Maine Hospital Compliance Rates for HAI & SCIP Process Measures, July 2012 to June 2013

The following table displays hospital compliance rates for three Healthcare Acquired Infection (HAI) measures and six Surgical Care Improvement Project (SCIP) measures seen in APPENDIX A. For all nine measures, higher scores are better. All performance rates at 95%-or-better are highlighted in blue.

Peer Group	Hospital	HAI-3*	HAI-4	HAI-5	SCIP-1a	SCIP-2a	SCIP-3a	SCIP-4	SCIP-9	SCIP-10
A	CMMC	96%	97%	97%	98%	98%	99%	98%	86%	100%
	EMMC	98%	100%	100%	99%	99%	99%	97%	98%	100%
	MGMC	100%	100%	100%	100%	99%	98%	n/a	99%	100%
	MMC	72%	82%	69%	97%	99%	98%	99%	100%	100%
B	Aroostook	100%	100%	100%	99%	99%	98%	n/a	98%	100%
	Mercy	99%	98%	78%	99%	99%	98%	n/a	98%	100%
	Mid Coast	100%	n/a	100%	100%	99%	99%	n/a	97%	98%
	Pen Bay	100%	100%	100%	99%	99%	96%	n/a	94%	100%
	SMMC	100%	99%	100%	99%	100%	100%	n/a	100%	100%
	St. Joseph	91%	n/a	100%	100%	99%	100%	n/a	100%	100%
	St. Mary's	100%	n/a	100%	99%	99%	97%	n/a	98%	100%
	York	100%	100%	98%	98%	99%	99%	n/a	96%	99%
C	Cary	31%	89%	100%	100%	99%	98%	n/a	98%	100%
	Franklin	100%	100%	93%	100%	98%	100%	n/a	94%	100%
	Goodall	93%	97%	88%	98%	97%	99%	n/a	100%	100%
	Maine Coast	73%	100%	100%	98%	99%	99%	n/a	100%	100%
D	Inland	100%	100%	100%	100%	100%	100%	n/a	100%	100%
	Miles	100%	100%	100%	100%	100%	100%	n/a	100%	100%
	NMMC	100%	100%	100%	100%	67%	100%	n/a	75%	100%
	Parkview	92%	100%	100%	98%	100%	98%	n/a	100%	100%
E	Blue Hill	n/a	n/a	n/a	98%	100%	98%	n/a	100%	100%
	Bridgton	100%	100%	n/a	100%	100%	85%	n/a	100%	100%
	CA Dean	n/a	n/a	n/a	100%	100%	100%	n/a	100%	100%
	Calais	83%	100%	n/a	100%	96%	98%	n/a	100%	100%
	Down East	100%	n/a	n/a	95%	100%	95%	n/a	100%	100%
	Houlton	100%	100%	100%	100%	100%	100%	n/a	100%	100%
	Mayo	100%	100%	100%	100%	100%	100%	n/a	100%	100%
	Millinocket	100%	100%	100%	96%	100%	100%	n/a	100%	100%
	Mt Desert Is.	100%	100%	n/a	100%	100%	100%	n/a	100%	100%
	Pen Valley	97%	100%	n/a	100%	100%	33%	n/a	n/a	100%
	Red-Fairview	100%	100%	97%	98%	100%	100%	n/a	96%	100%
	Rumford	100%	100%	n/a	92%	100%	100%	n/a	100%	100%
	Sebasticook	100%	100%	100%	95%	100%	100%	n/a	100%	100%
	St. Andrews	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Stephens	100%	100%	94%	100%	100%	100%	n/a	98%	100%
	Waldo	100%	100%	93%	96%	100%	99%	n/a	98%	99%

** See brief descriptions on next page*

n/a = hospital did not have any patients to whom the measure applied

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

Summary of Maine Hospital HAI 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 neo-natal intensive care unit patients per 1,000 central line catheter or umbilical days
MRSA	Number of healthcare associated Methicillin-resistant Staphylococcus aureus infections per 1,000 inpatient days
C. difficile	Number of hospital onset and community-onset healthcare facility associated Clostridium difficile infections per 10,000 inpatient days

Summary of Maine Hospital Compliance Rates for HAI & SCIP 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 pneumonia prevention measures among ICU patients on ventilators
SCIP-1a	Percent of all surgery patients receiving an antibiotic within one hour prior to any surgery
SCIP-2a	Percent of all surgery patients receiving the recommended antibiotic for their procedure
SCIP-3a	Percent of all surgery patients whose preventive antibiotics were discontinued within 24 hours after anesthesia ended
SCIP-4	Percent of cardiac surgery patients with controlled 6 AM post-operative serum glucose
SCIP-9	Percent of surgical patients whose urinary catheter was removed on postoperative day I or postoperative day 2
SCIP-10	Percent of surgery patients with perioperative temperature management

Appendix D: Purpose and charge for the Maine Quality Forum Subcommittee on HAI

Dirigo Health Agency, Maine Quality Forum

Goal The Maine Quality Forum subcommittee on Healthcare Associated Infections (HAI) aims to exchange ideas between various governmental agencies, private stakeholders, and consumers to reduce HAIs in Maine. This subcommittee will act as a discussion forum to inform, educate and provide input to the Maine Quality Forum and the Maine CDC- HAI Prevention Program on HAI topics.

Members

2	Members of Maine Infection Prevention Collaborative Coordinating Committee (one physician and one Infection Control Coordinator)
1	State Epidemiologist
2	Nominees of State Epidemiologist (at least one of whom will be a consumer as defined below)
1	Consumer representatives (as defined below) nominated by the Maine Quality Forum Advisory Council
1	Consumer (as defined below) nominated by the Maine Quality Forum Advisory Council
2	Nominees of the Maine Society of Health Systems Pharmacists
2	Representatives of clinical labs (one from MeCDC's HETL and a Microbiologist from a clinical laboratory).
1	Representative from long term care

For purposes of membership on this sub-committee, the following definitions will apply:

A ***consumer*** is an individual with significant personal experience with the health care system, either as a patient or caregiver, and who is not a provider or regulator of health care services.

A ***consumer representative or advocate*** is an individual who works for a nonprofit, mission oriented organization represents a specific constituency of consumers or patients and is not a provider or regulator of health care services.

Staff

The subcommittee will be staffed by a staff member of the Maine CDC, Division of Infectious Diseases and by a staff member representing the Maine Quality Forum. A consumer is defined as an individual with significant personal experience with the health care system, either as a patient or caregiver, and who is not a provider or regulator of health care services.

Activities

1. To act as a discussion forum on HAI topics with a wide-spectrum of professionals (Infectious Disease specialists, Infection prevention coordinators, Pharmacy, Lab, others) , consumers and government,
2. To act as an incubator for developing quality improvement initiatives on HAI,
3. To have a public discussion regarding HAI public reporting metrics and to advise Maine Quality Forum on the adoption of said metrics,
4. To discuss and evaluate the collection and use of specific HAI indicators for the scope and impact of surveillance and/or public reporting on healthcare quality,
5. To raise the public awareness of HAIs and of activities, policy and strategies to reduce HAIs in the state, and
6. To identify need and consolidate resources for professional and public health education on HAI.

The HAI subcommittee will meet quarterly.

Appendix E: Overview of the Maine State Healthcare Associated Prevention Plan, 2014

Healthcare-associated infections (HAIs) are now the fifth leading cause of death in the U.S. The number of HAIs per year is estimated at 1.7 million infections[22], and prevention strategies could likely reduce 70% of these infections.[23] Hence, HAIs are now part of the state's public health prevention programs.

The prevention of health care associated infections is an established initiative for the Maine Center for Disease Control and Prevention. It was funded in 2010 by the American Recovery and Rehabilitation Act (ARRA). Although that funding source has ended, federal CDC continues to provide some financial support. The Maine CDC works closely with a technical advisory group, the Maine Infection Prevention Collaborative (MIPC) and their Coordinating Committee. The MIPC holds monthly meetings where infection preventionists from all acute care hospitals can learn best practices through peer-to-peer learning.

To maximize efforts to reduce HAIs in Maine, the HAI Prevention Program of Maine CDC also collaborates closely with the Maine Health Data Organization (MHDO) and the Maine Quality Forum. Since the MIPC is restricted to hospitals, a new HAI subcommittee of the Maine Quality Forum was created to add input from clinical laboratory staff, long term care providers, pharmacists, and consumers. The focus of the HAI prevention plan is ultimately to reduce healthcare acquired infections in Maine. Below is a brief list of activities by the HAI Prevention Program in 2013:

1) **Improving hand hygiene**: Adequate hand washing is the cheapest and possibly the most effective way to reduce transmission of many HAI infections. Maine CDC and the MIPC have worked to improve hand hygiene compliance in healthcare facilities. Hand hygiene data has been collected by external observers twice a year in every hospital and the results shared with every CEO and infection preventionist. In December of 2013, the sixth of the statewide round of observations was completed.

2) **Reducing C. difficile infections:** Since C. difficile is now the most common HAI in the nation and in Maine, the HAI program has focused much of its efforts this year on reducing C. difficile. The HAI coordinator attended an international conference on C. difficile to share current methods of prevention with Maine facilities. The HAI program is currently collaborating with the Northeast QIO in a pilot project to reduce C. difficile in the Augusta/Waterville area. The HAI program and the Northeast QIO is working with five nursing homes, a local hospital, and medical directors in Augusta to reduce C. difficile occurrences by using evidence-based practices. The Augusta/Waterville area has a history of high infection rates of C. difficile, including the most virulent NAP1 variety. To develop a C. difficile infection, a person must have contact with the organism, and have an altered intestinal flora, often as the result of antibiotics. The Maine CDC is

[22] U.S. Government Accountability Office (September, 2008): Health-Care Associated Infections in Hospitals: An Overview of State Reporting Programs and Individual Hospital Initiatives to Reduce Certain Infections.

[23] U.S. Department of Health and Human Services (June 2009): HHS Action Plan to Prevent Healthcare-Associated Infections, http://www.hhs.gov/ophs/initiatives/hai/exsummary.html.

focusing on reducing unnecessary antibiotic use and reducing transmission of the organism by healthcare staff or by contamination of the patient's environment. The HAI program was invited to present its methodology and data to the Public Health Foundation in Washington, D.C.

Maine CDC has also assisted in C. difficile outbreaks in long term care, hospitals, and ambulatory surgical centers. In collaboration with the state lab (HETL), Maine CDC has increased lab capacity to identify C. difficile genotypes using PFGE in outbreak investigations. Maine CDC has presented the findings from C. difficile outbreaks to several professional groups.

3) **Improving antibiotic stewardship:** Maine CDC spearheaded efforts regarding antibiotic stewardship for outpatient prescribers. Maine CDC analyzed all hospital antibiograms to determine regional resistance. Maine CDC developed a Physician pocket reference guide for best prescribing practices for outpatients. Working with the Maine Medical Association, physicians across the state are receiving education and resources on antibiotic stewardship. The object is to reduce community acquired Clostridium difficile by reducing overuse and misuse of antibiotics.

4) **Increased feedback of validated HAI data**: This year, the HAI Prevention Program has increased communication of HAI data to hospitals. The intent is to provide feedback for administrators so that they might more effectively focus limited infection control and prevention resources to particular problem areas. As can be seen in the Annual Report, Maine now has HAI data on each hospital for central-line infections and prevention measures, C. difficile infections, and MRSA infections. Maine CDC prepared facility-specific dashboard reports of all known HAI prevention processes and HAI outcome measures and distributed a report to each hospital CEO. All C. difficile and MRSA-HAI data presented in this report was **validated** by the HAI Prevention Program.

   Increased public awareness of HAIs: The HAI Coordinator and the state medical epidemiologist have spoken at ten professional meetings to educate audiences regarding HAIs.

5) **Increased surveillance of MDROs:** Lastly, new multiple-drug resistant organisms are now in Maine. Carbapenem-resistant *Enterobacteriaceae* are a new public health threat. The Maine CDC is working to include this new organism on its list of notifiable conditions for surveillance.

Maine CDC, as administrator of the HAI Prevention Plan, is responsible for surveillance of health care acquired infections statewide. The focus for Maine CDC is primarily on outcomes, i.e. health care associated infections. However, to accomplish surveillance and determine improvements requires data. Hence, much of the work of Maine CDC is to build a surveillance system whereby hospital data is collected, analyzed, and validated. That way, unusual HAI activity can be detected in a timely fashion and controlled more effectively. The data is also being communicated to healthcare providers to provide timely feedback and make infection prevention efforts more focused and efficacious.

Appendix F: 2013 Annual Report of the Maine Infection Prevention Collaborative (MIPC)

EXECUTIVE SUMMARY

The Maine Infection Prevention Collaborative (MIPC) established in 2008, consists of Maine hospital Infection Preventionists, Infectious Disease specialists and key partners. Maine CDC, the Maine Hospital Association, the Maine Quality Forum, the Northeast Healthcare Quality Foundation and the Maine Health Data Organization are integral participants in the collaborative. The mission of the MIPC is to improve the health of the people of Maine by preventing and controlling healthcare-associated infections and the burden of drug resistant organisms.

Major Accomplishments of the collaborative in 2013 included:

- Sustained program for external hand hygiene observations statewide, collecting compliance information at each hospital twice per year and collectively demonstrated ongoing improvement in hand hygiene compliance.
- Continued to clarify, educate and review definitions and reporting requirements for NHSN. Provided education on interpreting and utilizing the Standardized Infection Ratio.
- Served as the state's Healthcare-Associated Infection Prevention Advisory Council for implementation of the state plan.
- Developed core privilege chart for Infection Preventionists in Maine hospitals based on the APIC Competency Model to assist IPs in communicating the scope of infection prevention to hospital leadership. The Maine Hospital Association Quality Council assisted in bringing these before hospital executives.
- Identified high turnover resulting in 60% of IPs in the state with less than 2 years' experience in infection prevention. Recognizing the impact on infection prevention programs and initiatives the collaborative:
    - Provided education, networking, and mentorship to new hospital IPs.
    - Initiated development of a comprehensive resource manual for IPs including evidence based practice guidelines, state specific resources, and key references.
- Advocated and supported rule changes that accepted NHSN as the vehicle for public reporting of HAI data required by the state of Maine.

The MIPC's major goals for 2014 include:

- Redesign the collaborative to better facilitate active participation by all members and further the mission of the collaborative.
- Develop and implement strategies to reduce C-Difficile infection by 20% over two years in collaboration with the Maine CDC, Maine Hospital Association and other stakeholders.
- Continue to focus on hand hygiene and re-evaluate strategies for improvement.
- Implement and publish the Resource Manual for Infection Preventionists to a website for Maine IPs.
- Develop mentorship for new Infection Preventionists.
- Continue to serve as the state's multidisciplinary advisory group to guide and support the prevention and surveillance activities outlined in the state HAI plan.

FULL REPORT

In 2008, Maine's hospitals formed the MIPC in partnership with the Maine Quality Forum, the Maine Hospital Association, the Maine Center for Disease Control and the Northeast Health Care Quality Foundation. The function of this collaborative is to review, develop and share experience and expertise in the prevention of healthcare associated infections and to continuously improve the health and safety of patients and providers by seeking to uniformly employ the best evidence based practices of infection prevention. The collaborative's strategies to achieve these goals include:

- Collaborative development and implementation of evidence-based protocols and guidelines
- Standardization of data collection and the analysis and sharing of infection prevention performance indicators

Infection Prevention professionals from all Maine hospitals as well as representatives from other key organizations are invited to participate in the collaborative. Hospitals pledged support and participation in the collaborative. In the 5 years since its inception, the MIPC has developed a cohesive, collegial group with participation from hospitals across the state.

In 2013 the collaborative was impacted by challenges affecting its members and mission. Turnover of IPs resulted in an influx of new IPs with less than two years' experience in the specialty. Individual IPs reached out to their new peers to provide guidance and mentorship. The collaborative incorporated networking and education sessions to assist them in understanding public reporting requirements and methods. Members' attendance and participation were challenged by increasing demands on time and resources within their organizations.

SUSTAINED EXTERNAL HAND HYGIENE OBSERVATIONS

In 2012 a self-sustaining program for external hand hygiene observations was established. The goal of the program was consistent, accurate twice yearly hand hygiene observations performed by expert unidentified observers at all Maine hospitals. Refresher training on conducting observations and review of methodology were done to assure consistency between observers. External observations were performed at all Maine hospitals in June and December 2013. Maine CDC compiled observations which were compared by hospital peer group and shared with MIPC members and subsequently with hospital CEOs. External hand hygiene observations from 2011 through 2013 demonstrated consistent improvement within individual hospitals and statewide. The collaborative has decided to maintain a focus on hand hygiene for 2014 and to review/develop the next strategies for improvement.

HAI REPORTING THROUGH NHSN

The Maine CDC and MIPC recommended a rule change to Chapter 270 allowing for state HAI reporting requirements to be met by submitting data through the NHSN. This eliminated redundant reporting for PPS hospitals. The rule change was adopted. Critical Access Hospitals which currently do not submit certain data elements to NHSN may continue to submit via spreadsheet to the MHDO. MIPC members from the Northeast Healthcare Quality Foundation provided updates on NHSN definitions and reporting requirements and educational sessions for members on data entry. After discussion at MIPC and MIPC-CC, the collaborative agreed to switch from reporting of MRSA-HAI to MRSA-LabID. The group recognizes that MRSA LabID is a proxy measure for MRSA-HAI and meets state reporting requirements while simplifying the reporting process. The Maine CDC continues to provide validation of MRSA and C-

Diff data. Validation of CLABSI (central line associated blood stream infection) data was done by the John Snow Institute of Boston, Massachusetts.

SUPPORTING INFECTION PREVENTIONISTS AND THE MISSION OF MIPC

A crucial component of continuing the mission of the MIPC in reducing health care acquired infections and promoting patient safety in Maine hospitals is sustaining a highly competent and involved population of Infection Preventionists. The MIPC initiated two strategies to meet this need. The first was with the support of the Maine Hospital Association and the MHA Quality Council to develop a tool outlining the scope of practice and core privileges of Infection Preventionists. The Quality Council then used this information to encourage hospital executives to support the role of Infection Preventionists within their organization and to support active participation in MIPC.

The second strategy was to develop a comprehensive resource manual for Infection Preventionists, particularly new IPs. Each member of the MIPC contributed information based on his/her areas of expertise. Information includes state resources, contact information for other IPs, evidence based practice guidelines, NHSN resources, sample policies, and links other resources. The completed manual will be a living document that is updated as new information becomes available. MIPC is collaborating with APIC Pine Tree Chapter to place the manual online via a secure website. In 2014 the goal is to complete and publish the manual.

MIPC members expressed challenges to participating in MIPC meetings and initiatives related to time constraints, travel, and financial resources. Members continue to find value in the collaborative and desire to maintain active participation. In 2014 the MIPC is collaborating with the APIC Pine Tree Chapter to explore innovative ways to meet the needs of IPs and to further the mission of reducing HAIs.

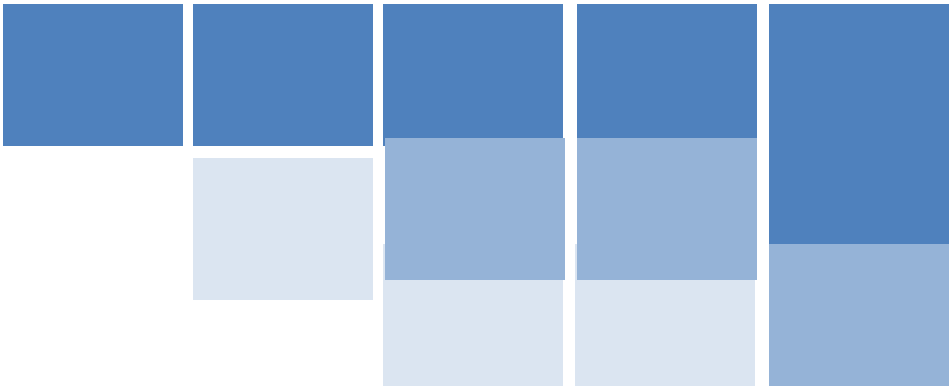
The MIPC Coordinating Committee continues to support the efforts of the MIPC, helping to access resources of supportive partners, collaborate on the State HAI plan, and provide leadership and commitment to infection prevention goals.

The MIPC is a dynamic and knowledgeable group of impassioned Infection Preventionists. Their work is essential to the health of the population of the state of Maine. They do not function alone in this endeavor and must rely on the dedicated work of many stakeholders and healthcare professionals across the continuum of our healthcare system. These efforts combine to improve the health of the people of Maine by preventing and controlling healthcare-associated infections and the burden of drug resistant organisms in our hospitals and communities. The MIPC looks forward to continued collaboration with key stakeholders and anticipates new connections with stakeholders who have yet to be identified in our continued efforts to accomplish our mission.

Respectively submitted by

The Maine Infection Prevention Collaborative

Appendix G: Maine Hospital CLABSI Validation Report



Validation of Central Line Associated Blood Stream Infection (CLABSI) Data in Maine Hospitals

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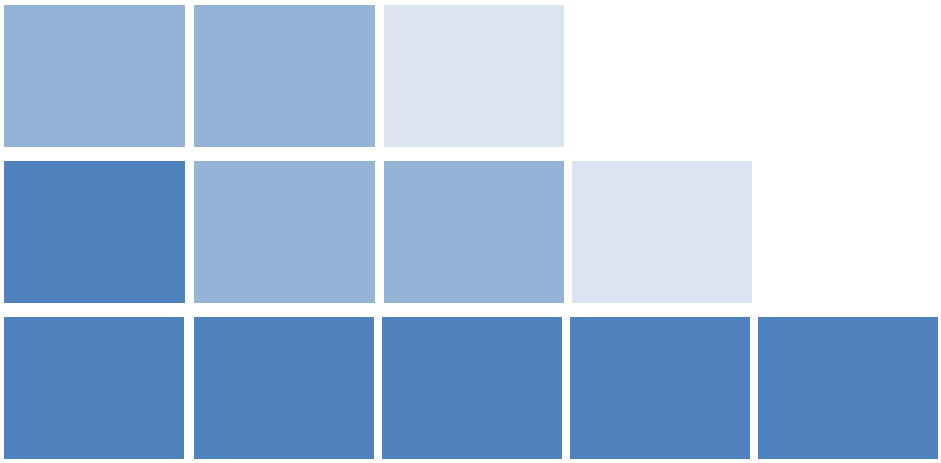
FINAL REPORT

John Snow, Inc.

September 2013



ACKNOWLEDGMENTS

The JSI team is very grateful for the opportunity to work with Peg Shore, the former Maine CDC HAI Coordinator. Without her assistance, the study would not have been possible. We are also deeply indebted to the many hospital infection preventionists and other helpful staff who supported and assisted in the validation activities.

Validation conducted and report written by:

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With assistance from Lisa Hirschhorn MD, MPH and Jacqueline O'Brien BA

This project was funded by the Maine Dirigo Health Agency.

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VALIDATION OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI) DATA IN MAINE HOSPITALS: **Final Report**

I. INTRODUCTION

The Maine Quality Forum and the Maine Infection Prevention Collaborative are using a selected set of healthcare associated infection (HAI) measures to assess the performance of the state's hospital facilities with respect to infection prevention. One of the outcome measures being reported by Maine hospitals is the central line associated blood stream infection (CLABSI), a serious but uncommon complication that is considered largely preventable. Hospitals submit CLABSI data to the Maine Health Data Organization using the standardized definitions developed by the federal Centers for Disease Control and Prevention (CDC) and the reporting platform known as the National Healthcare Safety Network (NHSN).

The Maine Quality Forum receives the data and CLABSI rates by facility are part of the "Annual Report on Healthcare Associated Infections in Maine"[24]. Facility CLABSI rates are calculated and compared to previous years and to national benchmarks. In the most recent report, the annual weighted average rate for CLABSI (per 1,000 intensive care unit central line days) for all Maine hospitals from July 2007 to June 2012 improved by about 0.2 fewer infections per 1,000 patient days each year.

CDC has recommended that states use available resources to validate the completeness and accuracy of CLABSI reporting, recognizing that the definitions are complex and the intensity of HAI surveillance can vary between facilities. In late 2012, NHSN validation guidance and the first toolkit were released for validation of CLABSIs in intensive care unit (ICU) patients[25]. This document provides detailed methods for both internal and external validation, including selection of facilities and sampling frame for patient records to audit. In the Spring of 2013, external consultants from John Snow, Inc. (JSI) were funded to carry out a detailed CLABSI validation for ICUs in the twelve Maine hospitals classified as Peer Groups A and B by the Maine Hospital Association. This report summarizes the results of this external validation.

II. METHODS

A team of JSI consultants (including an infectious disease physician, PhD nurse epidemiologist/former infection preventionist, certified research nurse and specially trained research assistant) applied the CDC methods for external CLABSI validation. These individuals had completed HAI validation at all hospital

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[24] 2013 Annual Report Healthcare Associated Infections in Maine; Submitted to: Joint Standing Committee on Health and Human Services; Dirigo Health Agency/Maine Quality Forum. May, 2013 (revised post release on 5.6.13) http://www.dirigohealth.maine.gov/Documents/HAI_report_2013.pdf

[25] National Healthcare Safety Network (NHSN) Validation Guidance and Toolkit 2012: Validation for Central Line-Associated Bloodstream Infection (CLABSI) in ICUs, http://www.cdc.gov/nhsn/toolkit/validation-clabsi/

facilities in Massachusetts and New Hampshire in the previous four years, so were very experienced in applying NHSN definitions.

The CDC CLABSI validation approach provides a process for facility selection that could be used by all states, including those with larger numbers of hospital facilities than Maine. Because the JSI contract was established based on the state's request to validate the hospitals in Peer Groups A and B (total of 12), CDC's facility selection algorithm was not implemented. However, it is likely that the CDC process would have yielded a group of comparable facilities to those included.

The sampling frame for medical record selection within the 12 facilities was developed based on the complete list of positive ICU blood cultures for the year 2012, as specified in CDC's validation methodology. JSI established a secure data transfer mechanism and received these lists, which were generated from the laboratory information management system and not from an infection surveillance database. In order to be able to identify CLABSIs reported to NHSN by the facilities, JSI received a list of these events from the Maine HAI Coordinator.

CDC's method calls for a total screening sample of up to 60 medical records per facility, using a stratified approach. Stratum 1 includes reported CLABSI events in ICU or NICU patients and stratum 2 captures a group of targeted pathogens: *Candida or Torulopsis spp. (yeast), Enterococcus spp., Staphylococcus aureus, including MSSA and MRSA, coagulase-negative staphylococcus, including non-aureus staphylococcus spp., and common gram-negative organisms (Klebsiella spp., E. coli spp., or Pseudomonas spp.)*. Blood cultures positive for all other organisms are considered stratum 3. The rationale for oversampling the targeted pathogens was to assess competency in correctly using different components of the NHSN CLABSI definition. For example, the inclusion of enteric organisms tests ability to differentiate alternative NHSN primary infections like in UTI, GI or IAB from primary bloodstream infection.

The CDC method of random record selection for validation starts with all reported CLABSI events from the facility during the period and reviews up to 20 of these (stratum 1). For facilities with NICUs, all (up to 10) unreported candidate CLABSIs are selected from stratum 2 at random; stratum 3 are included if needed to reach 10. For non-NICUs, the first 30 random records from stratum 2 are selected next. Finally, random records from stratum 3 are included to reach the target of 40 for non-NICU facilities and 60 for NICU facilities.

Hospitals received instructions for securely providing microbiologic data used in CLABSI case identification and dates were selected for the on-site visits. Record access including electronic data system passwords were arranged upfront for the on-site visits, including data privacy agreements. Reviewers were blinded to the CLABSI event status/stratum of the cases during the review. Detailed patient-level information from records reviewed was captured on paper forms modeled after the NHSN validation toolkit forms. Printed copies of consults and progress notes were collected for later case discussions when the reviewers identified a CLABSI, in case discrepancies were noted between facility classification and the JSI team assessment.

Completion of a written survey was requested for each ICU (CDC Toolkit Appendix 2) to provide an understanding of the process employed to gather the central line day data used as the denominator for rate calculation. The survey also included knowledge checks related to definitions and how to count patients with permanent and/or multiple central lines.

As shown in Table 1, the JSI team validated the six largest hospitals on-site through direct medical record review. To reduce travel expenses and maximize time efficiency, the six smaller hospitals were validated remotely. For the remote reviews, JSI screened the information provided by the laboratory to assess the likelihood of CLABSI based on timing of positive culture (i.e., relationship of culture date to admission date). For organisms like coagulase negative staph and other common skin contaminants/commensals captured in NHSN CLABSI category 2, there must be 2 or more positives within a specific timeframe, which was also used to limit the number of candidate CLABSIs to further assess. A phone discussion was held about the delimited list of cases to determine if a central line was in place. For suspicious cases, the facilities were asked to submit additional documentation (laboratory reports, infectious disease consults, progress notes, etc.) to help classify the event as a CLABSI or not.

Table 1. Acute care hospital facilities included in JSI CLABSI validation (2012)

Facility-Location	***Peer Group***	***Approach***	***Beds***	***ICUs***
Maine Medical Center - Portland	A	On-site	606	6*
Eastern Maine Medical Center - Bangor	A	On-site	411	4*
Maine General Medical Center - Augusta/Waterville	A	On-site	287	2
Central Maine Medical Center -Lewiston	A	On-site	250	2*
St. Mary's Regional Medical center-Lewiston	B	On-site	233	1
Mercy Hospital-Portland	B	On-site	230	1
Aroostook Medical Center -Presque Isle	B	Remote	105	1
Mid Coast Hospital- Brunswick	B	Remote	104	1
Pen Bay Medical Center-Rockport	B	Remote	109	1
Sothern Maine Medical Center-Biddeford	B	Remote	150	1
St. Joseph's Hospital-Bangor	B	Remote	112	1
York Hospital-York	B	Remote	66	1
TOTAL			**2663**	**22**

*Facility has Neonatal ICU (NICU)

III. RESULTS

Table 2 provides details of the six hospital facilities that were reviewed on-site through direct auditing of medical records by the JSI team. The number of positive blood cultures in this group of facilities varied widely, reflecting differences in number of ICU beds and patient acuity. Sixteen percent of the positive blood cultures were associated with reported CLABSI events. Approximately 2/3 had organisms that were among the targeted pathogens per the CDC validation methodology.

Table 2. Positive blood cultures and screening samples by strata for 6 facilities validated on-site

2012 Microbiology Laboratory reports	**CMMC**	**EMMC**	**MGMC**	**MMC**	**MERCY**	**ST MARYS**	**SUBTOTAL**
ICU patients with positive cultures	91	130	17	145	22	33	438
Positive blood cultures	200	200	23	307	30	53	813
Cultures related to CLABSI events (stratum 1)	2	27	4	98	0	1	132
	1%	*14%*	*17%*	*32%*	*0%*	*2%*	*16%*
Cultures with targeted pathogens (stratum 2)	144	135	13	174	22	33	521
	72%	*68%*	*57%*	*57%*	*73%*	*62%*	*64%*
Other positive cultures (stratum 3)	54	38	6	35	8	19	160
	27%	*19%*	*26%*	*11%*	*27%*	*36%*	*20%*
Screening sample (cultures)	129	78	23	173	30	33	466
% of total cultures screened	*65%*	*39%*	*100%*	*56%*	*100%*	*62%*	*57%*

For the six smaller hospital facilities that were validated through the remote process, there were far fewer positive blood cultures (Table 3). Only 2% of the positive blood cultures from this group were related to reported CLABSI events. Using the remote review approach, JSI was able to validate all of these cases with assistance from the infection preventionists by phone. The vast majority of these positive cultures represented infections that were present on admission. In this group of facilities, the use of central lines was relatively uncommon.

Table 3. Positive blood cultures and screening samples by strata for 6 facilities validated remotely

2012 Microbiology Laboratory reports	**AROOSTOOK**	**MIDCOAST**	**PEN BAY**	**SMMC**	**ST JOSEPH**	**YORK**	**SUBTOTAL**
ICU patients with positive cultures	28	13	15	35	13	7	111
Positive blood cultures	29	16	27	58	22	17	169
Cultures related to CLABSI events (stratum 1)	2	0	0	1	0	0	3
	7%	*0%*	*0%*	*2%*	*0%*	*0%*	*2%*
Cultures with targeted pathogens (stratum 2)	21	15	19	37	20	10	122
	72%	*94%*	*70%*	*64%*	*91%*	*59%*	*72%*
Other positive cultures (stratum 3)	6	1	8	20	2	7	44
	21%	*6%*	*30%*	*34%*	*9%*	*41%*	*26%*
Screening sample (cultures)	29	16	27	58	22	17	169
% of total cultures screened	100%	100%	100%	100%	100%	100%	100%

Overall, the external validation process uncovered a small number of unreported or misclassified CLABSIs. As shown in Table 4, corrections were necessary in 4 of 12 facilities (33%) but each of these had only one discrepant case. From reviews of 333 records, the validation team identified 3 missed CLABSI events and 1 incorrectly reported CLABSI. The details of these four cases are provided in Table 5. After being notified of the errors, the facilities corrected their NHSN data accordingly.

Table 4. Results of CLABSI validation by facility

FACILITY	RECORDS REVIEWED FOR VALIDATION	REPORTED CLABSI EVENTS 2012	CHANGES TO REPORTED EVENTS
CMMC	43	1	0
EMMC	47	11	0
MGMC	17	3	0
MMC	**60**	**28**	**+1**
MERCY	**22**	**0**	**+1**
ST MARYS	33	1	0
AROOSTOOK	**28**	**2**	**-1**
MIDCOAST	13	0	0
PEN BAY	15	0	0
SMMC	35	1	0
ST JOSEPHS	**13**	**0**	**+1**
YORK	7	0	0
TOTAL	**333**	**47**	**+2 (new total 49)**

Table 5. Discrepant cases requiring NHSN CLABSI corrections

CASE	FACILITY	CHANGE IN NHSN STATUS	ORGANISM	ICU DAY	REASON FOR DISCREPANCY
1	Aroostook	remove	*Staph Aureus*	1	Error in NHSN entry; related to SSI not CLABSI
2	MMC	add	*E. Coli*	12	Attributed by NICU team to necrotizing enterocolitis but did not meet NEC NHSN definition; Infection Preventionists had asserted this but were overruled
3	Mercy	add	*Staph epidermidis*	4	Meets criteria for Category 2 CLABSI, multiple Staph epidermidis cultures and symptoms
4	St Josephs	add	Coag negative Staph (CNS)	5	Meets criteria for Category 2 CLABSI, multiple CNS cultures and symptoms

The ICU survey developed by CDC was used to assess methods and knowledge of how to count ICU patient days and central line days, which are used to calculate CLABSI rates. Surveys were completed by 15 of the 22 ICUs, with each facility completing at least one. As shown in Table 6, only three ICUs reported capturing central line days electronically. For the 7 knowledge questions regarding how to count central line days, there were many errors, particularly for the items that dealt with permanent catheters and/or multiple central line patients. NHSN definitions specify that a patient with multiple lines should only be counted once. However, many of the ICUs responded that they would count all the lines. There was also some confusion about adhering to a regular time each day for doing the count and how to handle patients whose lines are removed a few hours before the count. The overall error rate on these questions was 25%.

Table 6. Results of Denominator Survey in 15 ICUs responding

HOSPITAL	CENTRAL LINE DAY METHOD	ERRORS IN 7 COUNTING QUESTIONS
CMMC	Electronic	0
EMMC	Manual	1
MGMC	Manual	1
MMC-1	Manual	2
MMC-2	Manual	4
MMC-3	Manual	4
MMC-4	Manual	1
MERCY	Electronic	0
ST MARYS	Manual	0
AROOSTOOK	Manual	2
MIDCOAST	Manual	3
PEN BAY	Manual	4
SMMC	Electronic	1
ST JOSEPHS	Manual	3
YORK	Manual	0
	TOTAL ERRORS (of 105)	**26**

IV. DISCUSSION

Overall knowledge of the NHSN CLABSI definition and how it should be applied to ICU settings was very high, as demonstrated by the accuracy of CLABSI reporting. In general, the infection preventionists in the validated facilities demonstrated clear understanding of the surveillance definition and were aware that such cases may not always be considered a clinical CLABSI case requiring treatment. The four incorrect cases did not reflect any systematic biases or knowledge deficits on the part of the reporting facilities. One of the cases in a NICU patient was considered a reportable CLABSI by the infection prevention staff. However, the clinical leadership of the NICU disagreed and instructed them not to report the case. The other two missed cases were category 2 CLABSI events with multiple positive cultures and the required symptoms in patients with a central line. These were potentially not considered clinically significant and therefore, might have been overlooked by the NHSN reporting staff of the facility.

Although the JSI team had considerable previous HAI validation experience, this project was the first opportunity to follow the CLABSI validation methods recently released by CDC. The main difference from JSI's earlier approach is the method of randomly selecting the review sample while prioritizing the targeted pathogens. The CDC method also does not screen out cultures drawn close to the time of admission, which had been part of JSI's original strategy. Because of these differences, it is not possible to compare the findings in Maine to the other states JSI has validated. There are no published reports yet of external validation results from other states using the new CDC toolkit that could provide a frame of reference for the Maine findings. Because of these limitations, no qualitative assessment of the current results can be made.

There appears to be a need to improve ICU staff's understanding of how to count central line days; this requires ongoing vigilance on the part of the infection preventionists and other designated specialists/educators. However, it is unlikely that the errors would have a major impact on the previous denominator data because the likelihood of having patients with multiple central lines is quite low for most ICUs.

In conclusion, after validation of ICU CLABSI reporting for 2012 in twelve Maine acute care facilities, a minor adjustment was made to increase the number of events from 47 to 49. Three hospitals had a missed CLABSI event added and one hospital had an incorrectly reported event that was removed. Understanding of the NHSN definitions was quite high for most of the 12 infection prevention programs.

Appendix H: Maine CDC MRSA-HAI and C.difficile LabID Validation Report

March 3, 2014

Maine CDC is charged by the Legislature to validate nosocomial MRSA and hospital-associated C. difficile infections prior to publication of the Annual Report of HAIs by the Maine Quality Forum. This year's validation was performed by two HAI data analysts. The method used and the findings are discussed below.

Method:

MRSA-HAI: All hospitals are required by state law to report all nosocomial MRSA to NHSN. In the past two years, this data has been reported as a MRSA-HAI, and includes all types of infections caused by that organism for inpatients only, hospital-wide. As of January, 2014, all hospitals have agreed to change to the MRSA-LabID events for future reporting. Validation of the MRSA-HAI is difficult because there is much subjectivity in data abstraction. The criteria used is found in 26 pages of the NHSN manual. Last year, all MRSA-HAIs were validated; while this year, a sampling method was used. Thirteen hospitals were selected for C. difficile LabID, and 10 hospitals for MRSA-HAI. A total of 22 hospitals underwent validation. The remaining 14 hospitals will be considered a priority for validation next year.

MRSA-HAI validation method:

Sampling for MRSA-HAI: The greatest number of reported MRSA-HAI infections last year were surgical site infections (SSI) and pneumonias, and these infections also had the most number of inaccuracies. Therefore, they were the focus for this year's validation.

The 10 hospitals to be validated were chosen using these criteria:

- At least 1 hospital from every peer group
- Hospitals with many inaccuracies in 2011
- All hospitals reporting 20 or more MRSA-HAIs in 2011
- All hospitals with rates above the state average in 2011
- At random, a hospital with a new infection preventionist

The following hospitals fit the above criteria: MGMC, EMMC, MMC, Mercy, St. Mary's, PenBay, Goodall, Parkview, RFGH, Stephen's Memorial Hospital.

The steps used in the validation of MRSA-HAI were:

1) Maine CDC requested a lab line-list of all *inpatient* MRSA positive for sputums and wounds from July 1, 2012 to June 30, 2013, including patient medical record number, birthdate or name, admission date and specimen date.

2) For sputum cultures, Maine CDC focused on cultures that were collected 3 or more days after admission. Using this reduced list, these specimen results were checked against a line-list of reported MRSA-HAIs in NHSN for that hospital for that event date. Only those that were not reported in NHSN were followed

further. A list of these patients was submitted to the infection preventionist, or in some cases were followed by the contractor, to check radiology reports, the first criteria for MRSA-pneumonia. If the patient had a positive chest X-ray in the first 3 days of the hospital stay, it was considered present-on-admission (POA). However, if there was a positive chest X-ray that was persistent and progressive at or after Day 4, it was further reviewed.

3) For wounds, certain types of wounds were not followed because they are usually community onset: cellulitis, abscesses, and facial wounds. The remaining wounds were checked against a line-list of reported infections on NHSN. For those not reported in NHSN, the IP was asked to check if patient had surgery in past 30 days. If surgery had occurred, the case underwent a chart review.

4) On site chart reviews were done in two hospitals: EMMC and MMC, mostly due to the volume of research required. In all other hospitals, the Infection Preventionist was able to review the list of selected charts. Both EMMC and MMC required a full day for the contractor to review the selected charts. Any omissions were checked by Maine CDC for entry into NHSN.

Findings:

The table below lists the number of charts that fit the criteria for each hospital, the number of charts reviewed, and the number of inaccuracies found.

MRSA-HAI validation results:

Peer Group	Hospital	Original number of charts to review	Charts reviewed in depth	Number of discrepancies
A	MGMC	56		0
A	EMMC	88		0
A	MMC	129		0
B	Mercy	52		4 (2 SSI, 2 PNX)
B	St. Mary's	61		1
B	PenBay	80		2 (SSIs)
C	Goodall	64		0
D	Parkview	30		0
E	RFGH	64		0
E	Stephen's Memorial	53		0
	TOTAL	677		7 (1%)

C. difficile LabID events validation method:

The focus was on hospital onset (HO) and community-onset but healthcare facility associated (CO-HCFA).

Hospital selection criteria for validation:

- At least one hospital from every peer group
- All hospitals with C. difficile rates greater than the state average (as reported from 10/1/2011 to 9/30/2012) with at least 4 infections reported.
- Hospitals with large differences between CDIs reported last year compared to this year.
- Hospitals with a newly hired inexperienced IP.

Thirteen hospitals underwent validation of data from October 1, 2012 to September 30th, 2013: CMMC, St. Josephs, TAMC, Mercy, MaineCoast, Miles, Mayo, Houlton, MMC, Inland, Stephen's Memorial, NMMC, and Millinocket. The latter five hospitals were selected due to a large decrease in number of CDIs reported between this year compared to last year.

The steps used in the validation of CDI-LabID events:

1) A letter was sent to the IP to deliver a lab line-list of positive C. difficile for all patients in 2013, inpatient and outpatient, including the patient medical record number, birthdate or name, admission date and specimen date.
2) The data was reviewed for specimens that were done three days or more after admission, and compared to an NHSN line-list of CDIs reported as hospital onset. If patient was listed as HO, the review was discontinued.
3) For patients with positive cultures on the day of admission, the IP was asked to check if the patient was hospitalized in the past 90 days. If yes, the hospitals were requested to add the data to NHSN as a CO-HCFA.
4) A week later, Maine CDC checked to verify that omissions had been reported to NHSN. A log of the number of omissions by hospital was created for use in the final report.
5) Denominators were calculated by Maine CDC. For CDI, all units were included except nursery and NICU (include psych, rehab, OB, and pediatrics). These were obtained using rate tables for all hospitals for C diff LabID for the above dates. Whenever possible, facility-wide data was used. All CMS hospitals were required to report facility-wide Inpatient data for 2013. If the hospital was missing quarters for 2012, the summary data was checked by Maine CDC for monthly reports and calculated for 3 months by unit. (The NHSN rate tables often had missing data that had been entered by the hospitals in the summary data. NHSN was notified by Maine CDC of the problem.
6) For numerators, once the hospital was validated and the omissions were determined to have been entered in NHSN, the total numbers of HO and CO-HCFAs were obtained from the NHSN frequency table. Differences between frequencies seen prior to validation versus after validation were recorded in a log. Rates for each hospital in each peer group were calculated and reported to Muskie, along with the total average rate for Maine hospitals. The total percentage of HO & CO-HCFA to total reported CDI was calculated and compared to last year's results. The summary of the CDI LabID events were reported to Muskie for inclusion in the annual report.

CDI LabID events Validation Results:

Peer Group	Hospital	Number of cases reviewed	Number of omissions	% omissions by hospital
A	CMMC	87	2	3%
B	St. Joseph's	37	13	35%
B	TAMC	23	0	0%
B	Mercy	61	0	0%
C	MaineCoast	12	0	0%
D	Miles Memorial	23	6	26%
E	Mayo Regional	8	0	0%
E	Houlton Regional	9	0	0%
Hospitals with large differences				
C	MaineCoast	12	0	0%
A	MMC	122	0	0%
D	Inland	12	0	0%
E	Stephen's	4	2	50%
D	NMMC	1	0	0%
E	Millinocket	4	1	25%
	Totals	365 events reviewed	26 omissions	7% omissions (all hospitals)

Findings:

MRSA: To ensure accurate surveillance and public reporting of MDRO-HAIs, validation is necessary. The overall results from this year's validation for MRSA-HAI is encouraging. The inaccuracy in reporting for 2012-2013 was 1%, compared to 20% last year. This level of inaccuracy is within the acceptable range of NHSN (5%). The omissions of MRSA-HAI were mostly from inexperience of the infection preventionist in accurately identifying SSIs and MRSA-pneumonias that fit NHSN criteria. PenBay had overlooked 2 SSIs and was unaware of the state requirement to report all MRSA-SSIs. When the IP of PenBay reported it to NHSN, it was not visible to Maine CDC due to problems with the group user permission. The Quality supervisor of PenBay was notified to correct the problem. Several SSIs and MRSA pneumonias were missed by Mercy Hospital. The newly hired IP has entered these into NHSN. The total number of MRSA-HAIs was slightly lower this year compared to the previous year (99 in 2012-2013 versus 114 in 2011-2012).

Clostridium difficile: C. difficile LabID events are easier to validate because the data is more objective since the criteria is based entirely on the date of specimen, date of admission, and a previous hospital stay in the past 90 days. The total number of positive specimens reported by labs statewide did not change from this year compared to last year, and is roughly 800 unduplicated cases inpatient cases. The accuracy of reporting varied widely between hospitals, from 0% to 50% omitted cases; however, statewide, the average was 7%. All of the inaccuracy was from omissions of cases which should have been entered in NHSN. Maine Medical Center has a unique reporting system (TheraDoc) which allows electronic transfer of lab data directly to NHSN. Because this

year's data was substantially less than last year's, an internal audit of the data was performed to ensure accuracy of reporting. After investigation by both the lab (Nordx) and the IP at the hospital, it is believed that there were no omissions.

In summary, this year's validation of MRSA-HAI and C. difficile required a review of over a 1,000 cases, and required extensive chart review of 677 potential cases of MRSA-HAIs. A total of 22 hospitals underwent validation; one hospital (Mercy) was validated for both types of infections. The MRSA-HAIs had little inaccuracies, probably due to the extensive education performed with the IPs when the data was validated last year. However, of the SSIs that were missed, it should be noted that they included organ-space infections, and not just superficial infections. The C. difficile LabEvent inaccuracies were largely due to the lack of data entry on the part of infection preventionists, and a lack of understanding of the need to report all positive inpatient CDI specimens, even those that were deemed to be community-onset. IPs will need to be reminded to enter their data in a timely manner; however, this may be the result of lack of adequate time and resources for IPs in general.

Glossary of Terms

Antibiotic stewardship – programs and guidelines that aim to reduce the overuse of antibiotics, for example, prescribing antibiotics for diseases they don't treat, such as the common cold. When antibiotics are overused, or when they're used improperly, they speed up the process of evolution where bacteria develop resistance to drugs. See *"drug-resistant bacteria".*

Bloodstream infection – a usually serious infection often causing longer hospital stays or even death. A large share of bloodstream infections are associated with the use of central line catheters. See *"central line catheter"* and *"Catheter-Associated Urinary Tract Infections".*

Clostridium difficile (C. difficile) – a particular type of spore-forming bacteria that can cause serious and sometimes fatal cases of diarrhea. C. difficile can grow and thrive when competing intestinal bacteria are killed off by antibiotics.

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 and 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 catheter that enters one of the major veins near the heart. See *"bloodstream infection"*.

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.

Drug-resistant bacteria – bacteria that are hard to treat because they have become immune to one-or-more types of antibiotics

HAI Data Set – the group of five quality indicators specified by Chapter 270 that measure the prevention of healthcare associated infections that can be caused by the use of a central-line catheter, umbilical catheter (in newborns), urinary catheter, or a mechanical device 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 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.

Joint Commission, The – the independent, non-profit organization that provides accreditation for U.S. hospitals and other healthcare organizations, and that develops and sets standards of quality including some of the HAI-related quality measures in this report

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 claims paid by private insurers, MaineCare and Medicare, and the agency that 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 hard-to-treat and sometimes deadly infection in the skin, 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 each and 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 are designed to measure the percent of times that something turns out well or something turns out 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.

Surgical Care Improvement Project (SCIP) measures – a set of quality indicators developed by the Joint Commission that measure how well hospitals comply with best practices to prevent harm to patients before, during and after surgery. The "SCIP-inf" measures covered by this report focus on preventing HAIs associated with surgery.

Surgical site infection (SSI) – an infection that occurs during a medical operation, or later at or near the surgical opening.

Ventilator-associated pneumonia (VAP) – a pneumonia infection caused by the use of a mechanical device used to assist a patient's breathing