Healthcare Associated Infection (HAI) in Massachusetts Acute Care Hospitals

July 1, 2008 – June 30, 2009

A report by the
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The Massachusetts Department of Public Health would like to acknowledge the work done by infection prevention professionals throughout the Commonwealth to address the issue of healthcare associated infections. This report is the result of collaboration between healthcare providers, the Bureau of Infectious Diseases Control and Response, the Bureau of Health Care Safety and Quality, the Betsy Lehman Center for Patient Safety and Medical Error Reduction, and many community partners. The Technical Advisory Group has also provided valuable direction and guidance to the Department as we continue in our efforts to reduce healthcare associated infections.

Executive Summary

The effects of preventable healthcare associated infections (HAIs) on patients and families, and the associated cost to the healthcare system, have become a prominent national healthcare issue. This report provides the background and history of the Massachusetts Department of Public Health (MDPH) efforts to address the serious public health issue of HAI, data related to HAI in Massachusetts acute care hospitals, and a summary of current and planned work.

HAIs are infections that patients acquire during the course of receiving medical treatment for other conditions within a healthcare setting. Massachusetts acute care hospitals have been required to report specific HAI measures to MDPH since July of 2008. Seventy-three hospitals have provided data for this report.

One goal of the report is to help consumers better understand HAIs and the work being done to prevent their occurrence. Some of the data highlight individual hospitals and allow comparison of infection rates to national rates. The data is not designed to compare individual hospitals to one another, but is intended to be used over time to monitor trends and to develop targeted improvement strategies. MDPH will use the data to identify issues and to inform public health policy.

The selection of measures presented in this report was guided by recommendations of the Centers for Disease Control and Prevention (CDC) who emphasized the importance of considering frequency, severity and preventability of HAIs and the ability to detect and report them accurately. The initial measures that best meet these criteria are central venous catheter blood stream infections (CLABSIs) and surgical site infections (SSIs). Additional measures will be collected from health care providers over time.

This is the first report containing hospital-specific data. In future years, additional measures will be reported at the hospital level. This data is self-reported and MDPH will be working with hospitals and the CDC to develop an ongoing program for validating the data. This is the next step in ensuring standardization across hospitals for optimal interpretation.

In an effort to raise awareness, promote transparency for healthcare consumers and motivate hospitals to prioritize infection prevention, several states require reporting of selected HAIs to their health authorities and some make this information available to the public. It is important to keep in mind that the goal of public reporting is to influence and improve the quality of care provided in the Commonwealth.

To assist the reader with some of the technical terms and abbreviations in this report, we have included a Glossary of Terms and Acronyms, found in Appendix A.

Introduction

This report presents information about healthcare associated infections (HAIs) reported by Massachusetts acute care hospitals to the National Healthcare Safety Network (NHSN) during the period July 1, 2008 – June 30, 2009. NHSN is a U.S. Centers for Disease Control and Prevention (CDC) monitoring system that uses consistent national measures. Participation in NHSN allows facilities to monitor HAI internally, and to measure results against national infection rates established by the CDC. NHSN was the reporting system recommended by the HAI 2008 Expert Panel and Massachusetts acute care hospitals were required by regulation to enroll in NHSN by April 1, 2008.

HAIs are infections that patients acquire during the course of receiving medical treatment for other conditions within a healthcare setting. HAIs can result from unintentional exposure to bacteria, viruses, fungi or spores caused by transmission from contaminated healthcare workers' hands, environmental surfaces, patient to patient contact, or staff failure to consistently use accepted prevention practices. They can also be part of the patient's underlying disease and a biologic problem not related to the health care itself.

The information contained in this report represents hospital specific data for the following HAI measures:

- Central line associated blood stream infections(CLABSI) in adult intensive care units (ICUs);
- Central line associated blood stream infections (CLABSI) in pediatric intensive care units (PICUs);
- Central line associated blood stream infections (CLABSI) in neonatal intensive care units (NICUs);
- Surgical site infections (SSI) related to hip arthroplasties and;
- Surgical site infections (SSI) related to knee arthroplasties.

The report also provides aggregate information that does not identify hospitals for:

- Surgical site infections (SSI) related to coronary artery bypass graft procedures (CABG); and
- Surgical site infections (SSI) related to hysterectomies.

Details about each of these measures are provided with the data.

This report provides the first hospital specific reporting and analysis of HAIs for acute care hospitals in Massachusetts and offers an overview of the multi-faceted effort underway to address the complex issue of HAI. Seventy-three hospitals provided data for the reporting period of July 1, 2008 through June 30, 2009. A listing of all of the reporting hospitals is in Appendix B.

MDPH epidemiologists responsible for data analysis create and review detailed quality assurance reports for each hospital and send the reports to hospitals bi-monthly. The epidemiologists work with hospitals to resolve any issues with the data. Hospital staff have the opportunity to review the hospital's own data and make the necessary corrections in NHSN as directed. This process provides ongoing guidance to improve the accuracy of the self-reported HAI data.

Individual hospitals treat different types of patients and provide different levels and types of care therefore not all hospitals collect and report data for all of the selected measures.

The intent of public reporting is to raise awareness, to provide consumers with information to guide healthcare decision-making and to encourage health care providers to reduce the occurrence of HAI. MDPH is committed to not only collecting, analyzing and reporting HAI data but also to providing support for HAI prevention and training activities.

Background

In 1999 the Institute of Medicine (IOM) published *To Err is Human – Building a Safer Health System,* a groundbreaking report that raised awareness of the problems associated with the quality of healthcare in the United States.[1] In addition to identifying the significant harm to patients and financial costs associated with medical errors, it highlighted healthcare associated infection (HAI) as an important problem affecting the American healthcare system. This document received widespread attention from the public, the healthcare industry, and state and federal policy-makers and has resulted in an increased focus on improving quality and safety in healthcare including efforts to address HAI.

Scope of the Problem

The CDC estimates that nearly two million patients develop one or more HAIs which contribute to 99,000 deaths annually [2], making HAI one of the leading causes of death in the United States.

Four types of infection account for more than 80% of all infections acquired in the healthcare setting:

- catheter associated urinary tract infections (CAUTI);
- surgical site infections (SSI);
- ventilator associated pneumonia (VAP) and;
- central line associated blood stream infections (CLABSI).

These infections not only have a negative personal impact on patients and their families, they are also adding to the nation's escalating healthcare costs. According to a cost analysis performed in 2007, the annual economic burden of HAI in Massachusetts ranges from $200 to $400 million annually.[3] A recent CDC report estimates the U.S. direct medical cost of treating HAI ranges from $35.7 billion to $45 billion annually.[4] While the economic burden for healthcare systems and individuals is large, the most difficult cost to measure is the substantial impact these infections have on patients and their families.

History of Prevention and Control of HAI in Massachusetts

The prevention and control of HAI is a national priority and many individuals, state and federal government agencies, providers, and private organizations are working to meet this healthcare challenge. MDPH is the agency responsible for monitoring diseases and environmental, occupational or chronic conditions throughout the state. State law provides the health department with the legal and regulatory authority to conduct surveillance and investigate the causes of communicable and other infectious disease outbreaks (105 CMR 300).

Massachusetts hospitals are also actively involved in HAI reduction activities intended to make care better and safer for patients. All hospitals licensed by MDPH are required to have a hospital-wide program for the prevention, control, and investigation of infectious diseases. These programs are managed by nurses, physicians, medical technologists, and other professionals who have acquired special training in infection control or epidemiology. Since the 1970's, hospitals have been collecting and analyzing data on HAI and on healthcare practices that have been shown to reduce the risk of HAI. Hospitals routinely collect this data

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[1] National Academy of Science, Institute of Medicine. *To Err is Human: Building a Safer Health System.* Kohn L, Corrigan J, Donaldson M, eds. 1999.

[2] Klevens RM, Edwards JR, Richards CL Jr. et al. Estimating Health Care-Associated Infections and Deaths in U.S. Hospitals, 2002. Public Health Rep. 2007; 122: 160-6. www.cdc.gov/ncidod/dhqp/pdf/hicpac/infections_deaths.pdf

[3] http://www.mass.gov/Eeohhs2/docs/dph/patient_safety/haipcp_final_report_pt1.pdf
http://www.mass.gov/Eeohhs2/docs/dph/patient_safety/haipcp_final_report_pt2.pdf

[4] http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf

to track internal performance, analyze institution-specific quality improvement, monitor trends within their facilities and target interventions for prevention and control.

In Massachusetts' landmark Health Reform Law, Chapter 58 of the Acts of 2006, a provision directed the MDPH Division of Health Care Quality to develop a Statewide Infection Prevention and Control Program. Program development was guided by an HAI Expert Panel that conducted a comprehensive assessment of the key issues surrounding HAI and formulated a substantial set of evidence-based recommendations and best practice guidelines including the public reporting of HAI measures by hospitals. Following the recommendations of the Expert Panel, the Public Health Council adopted an amendment to hospital licensure requiring acute care hospitals to report specific HAI related data beginning July 1, 2008. A preliminary report of four months of aggregate data was released by MDPH in April 2009.[5]

Chapter 58 also established the Health Care Quality and Cost Council (HCQCC), a mandated entity charged with identifying statewide goals for improving health care quality, containing health care costs, and reducing racial and ethnic disparities in health care. The Council receives input and advice from an Advisory Committee that includes representation from consumers, business, labor, health care providers, and health plans. Among the Council's specific strategies is the public reporting of HAIs and serious reportable events. MDPH Commissioner John Auerbach serves as a member of the Council.

A timeline of the development of the Massachusetts Infection Prevention and Control Program and the reporting and monitoring of HAIs is found in Appendix C.

HAI Expert Panel

Beginning in 2006, in collaboration with the Betsy Lehman Center for Patient Safety and Medical Error Reduction, MDPH brought together a panel of experts and key stakeholders to make recommendations for a statewide infection prevention and control program, including the potential reporting of HAI measures by hospitals. With the assistance of JSI Research and Training Institute, six Task Groups and an ad hoc pediatric subcommittee, involving additional local and national experts, reviewed available evidence and developed specific proposals for prevention and reporting of HAI. The final report of the Expert Panel was presented to MDPH and the Lehman Center on January 31, 2008. The information in this report provided the framework for the Statewide Infection Prevention and Control Program. The full report and recommendations can be found at www.mass.gov/dph/dhcq

The HAI Expert Panel Report: *Prevention and Control of Healthcare-Associated Infections in Massachusetts* was also published by the Agency for Health Research and Quality's National Guideline Clearinghouse™ (NGC)[6]. The NGC is a public resource for evidence-based clinical practice guidelines.

Technical Advisory Group

Following completion of the work of the HAI Expert Panel, an aggressive program to implement the recommendations began. In addition to the broad dissemination of the evidence-based recommendations and the adoption of mandatory reporting, a multidisciplinary HAI Technical Advisory Group (TAG) was established to advise MDPH on all aspects of the statewide HAI Prevention and Control Program. The TAG initially met in April 2008, and is chaired by the State Epidemiologist. The group's membership also includes hospital epidemiologists, infection preventionists, consumers and advocates, quality improvement professionals, representatives of insurers, and the hospital association. The TAG has provided ongoing guidance on all HAI issues including the results of reports and surveys, the application of surveillance and

[5] http://www.mass.gov/Eeohhs2/docs/dph/quality/healthcare/hai_prelim_report.pdf
[6] www.guideline.gov

control methods and the presentation of the results to healthcare providers and the public. The TAG meets quarterly and all meetings are open to the public. A full listing of TAG members and affiliations can be found in Appendix D.

Data Reporting Process

In 2008, licensure regulations for acute care hospitals were revised to incorporate requirements for reporting of HAI to MDPH and the Betsy Lehman Center (105 CMR 130.1701). Beginning July 1, 2008, hospitals were mandated to report central line associated blood stream infections (CLABSI) and surgical site infections (SSI) occurring as a result of selected orthopedic, cardiac and gynecological procedures to MDPH and the Betsy Lehman Center. The primary platform for data submission is the CDC's NHSN. A preliminary aggregate report of NHSN data, representing the first 4 months of CLABSI and SSI reporting, was released by MDPH April 2009.[7]

In summary, the data are submitted to NHSN, quality assurance reports are created by MDPH epidemiologists and reviewed with the hospitals, and the hospitals may make corrections. In the next phase of Massachusetts' HAI work, there will be an additional data validation process, involving chart review and additional work with hospitals in detecting HAI.

National Healthcare Safety Network (NHSN)

All infections reported to NHSN must meet the standard definition of an HAI:
A localized or systemic condition resulting from an adverse reaction to the presence of an infectious toxin(s) and there must be no evidence that the infection was present or incubating at the time of admission to the care setting. Clinical evidence may be derived from direct observation of the infection site or review of information in the patient chart or other clinical records.[8]

Participation in NHSN requires a considerable commitment by each hospital. Qualified infection preventionists (IPs) conduct HAI surveillance. IPs are professionals trained in nursing, microbiology, epidemiology or medical technology who have obtained additional education in infection prevention and control. Data entry can only be performed by NHSN users who have completed training on the CDC definitions and surveillance methodology and all protocols must be followed exactly. This provides a rigorous national and state standard of consistent collection of comparable data. Once data is entered it is immediately available to hospitals, NHSN, and MDPH for viewing, analysis and editing. Hospitals are authorized to view only their own facility or group specific information.

When collecting HAI data, facilities must enter information on all of the required procedures not just procedures resulting in infection. This means detailed information must be reported for every patient undergoing a procedure under surveillance in a hospital not just the small number of patients who develop infections.

Although not originally established as a system for mandatory reporting, twenty one states are currently using or planning to use NHSN to fulfill these requirements. CDC made NHSN available to all United States healthcare facilities at no charge in June, 2007 and is currently collecting data from more than 2400 facilities in all fifty states.

[7] http://www.mass.gov/Eeohhs2/docs/dph/quality/healthcare/hai_prelim_report.pdf
[8] http://www.cdc.gov/nhsn/PDFs/pscManual/2PSC_IdentifyingHAIs_NHSNcurrent.pdf

Additional HAI Reporting

In addition to reporting specific HAI measures to MDPH through NHSN, there are two data collection initiatives underway that utilize alternative systems for data submission. All acute care Massachusetts hospitals are currently collecting a uniform set of data on influenza vaccination rates of hospital personnel and have participated in a methicillin-resistant *Staphylococcus aureus* (MRSA) point prevalence survey for patients in intensive care units.

Influenza Vaccination Reporting

Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. The most effective method of preventing influenza virus infection and its potentially serious complications is to immunize. The majority of health care workers have not been vaccinated against seasonal flu in the past, despite the recommendation of numerous professional agencies and organizations including the CDC, the National Foundation for Infectious Diseases (NFID), the Infectious Diseases Society of America (IDSA) and The Joint Commission. According to the CDC, only 44% of health care workers received influenza vaccine during the 2006-2007 season.[9] Influenza vaccination provides protection for workers in health care settings and reduces risk in the patients they care for.

To gain a better understanding of the current rate of vaccine coverage and to evaluate the merit of this measure for public reporting, during the 2008-09 influenza season, MDPH required acute care hospitals to report their success in providing influenza vaccine to health care workers to the Betsy Lehman Center for Patient Safety. Data were reported at two time points, January 31, 2009 and March 31, 2009. The information was used to assess the reliability of the measure and the comparability across hospitals. Rates submitted for individual hospitals during this period were not made public but were used to inform policy changes implemented during the 2009-2010 influenza season. Slight modifications were made to the methodology for collecting this data for the 2009-2010 influenza season. Acute care hospitals are now required, pursuant to regulations promulgated in the fall of 2009, to report seasonal influenza vaccination rates of hospital personnel to MDPH no later than April 15, 2010. Analysis of this data will be made available to the public in a report to be issued by the fall of 2010.

Methicillin-resistant Staphylococcus aureus (MRSA) Point Prevalence

MRSA is a type of *Staphylococcus aureus* ("staph") bacteria that is resistant to some kinds of antibiotics. There has been increasing attention to MRSA from healthcare professionals and the media. Experts in the field agree that understanding the burden of MRSA is important when trying to decide how to try to prevent or control it in a facility. Point prevalence surveys measure the proportion of people in a specific group who have a disease or condition at a particular time. It provides a snapshot of the disease at a point in time. Point prevalence surveys are valuable tools that hospitals can use to estimate their overall MRSA problem.

As part of the Infection Prevention and Control Program, MDPH required all acute care hospitals to complete a one day collection of MRSA nasal cultures during the week of September 15-19, 2008 for patients in ICUs and report the information to the Betsy Lehman Center for Patient Safety. The preliminary findings from the first survey did not signal a need for procedural changes, but following consultation with the TAG, it was recommended that the survey be repeated to provide a second round of data collected. Neonatal intensive care units (NICUs) were excluded from the second screening survey due to low MRSA rates observed in the 2008 survey. All acute care ICUs excluding NICUs were required to report MRSA

[9] CDC Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009.MMWR 2009; 58(Early Release):1-52

point prevalence conducted on a single day during the week of September 14-18, 2009 to MDPH. Analysis of this data is underway and a brief report will be issued by fall 2010.

Massachusetts Data: July 1, 2008 – June 30, 2009

Using this Data – Important Information to Consider

It is important to consider the following when reviewing the data presented in this report:

- The overall quality and safety of a hospital should not be determined by the single measure of HAI. Many factors contribute to a hospital's quality of care.
- Age, underlying illnesses, and severity of disease place some patients at higher risk for infection.
- This data should not be used to compare hospitals. Results are affected by the types of patients treated in a hospital, the variety of services provided by the hospital, the intensity of surveillance efforts, and the interpretation of surveillance criteria, all of which can differ from hospital to hospital and make comparisons misleading.
- Hospitals that treat more complex patients with greater risk for infection may have higher rates.
- Sometimes high rates are based on small numbers, so both the number and the rate should be reviewed.
- The term "expected infections" is used in some of the data tables. This is a statistical term that predicts the number of infections a hospital would have, if that hospital had exactly the same infection rate as the national average.
- A higher rate of infection may indicate a true problem or simply better surveillance. A lower rate may reflect fewer infections, fewer high risk patients, or different levels of infection surveillance.
- Data submission was evaluated for completeness and accuracy, but, a formal process for data validation was not possible for this reporting period. An initiative to develop, pilot test and implement a statewide validation plan is currently under development and will be described in greater detail later in the report.

A glossary is included as Appendix A to help in understanding some of the abbreviations and terms in this report.

NHSN definitions are used throughout this report. It should be noted that NHSN's definition of a major teaching hospital is different from definitions used in other contexts.[10]

Standardized Infection Ratio (SIR)
The standardized infection ratio (SIR) is a measure that is used to compare how a single hospital's rates of infection compare to a 'gold standard'. In this case, that standard is the national rates reported by CDC in their annual report. The SIR compares the actual number of events at each hospital to an expected number of events. The expected number of events is calculated based on the national average rates of infection multiplied by the number of days people had a central line at the hospital or how many surgeries the hospital performed. If the SIR is 1, there is no difference between the number of events at the location in question and the national average. If the number is less than 1, there were fewer events at that location than expected, and if the number is above 1 there were more events at that location than expected.

[10] http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF

The national average rates of infection are reported separately, or stratified, according to locations where a person is being cared for or characteristics of the patient or the surgery such as how long the surgery took to perform or how sick a person was before they had the surgery, as these characteristics change the risk of someone getting an infection. The tables below are similarly stratified to provide a proper comparison.

The SIR is calculated as:

$$\text{Standardized Infection Ratio (SIR)} = \frac{\text{Actual Number of Infections}}{\text{Expected Number of Infections}}$$

This is a standard ratio that can be used to compare hospital performance over time. It is not designed to explicitly compare hospitals to one another.

How do we evaluate the SIR: Statistical Significance and Confidence Intervals?

As mentioned above, we use the SIR to compare Massachusetts hospitals to the national averages. A SIR of 1 would indicate that a hospital is doing the same as the national average. However, what does an SIR of 1.7 mean? Looking at the interpretation above, the hospital has more events than expected, but is it a lot more? To answer this question, we use statistical testing to determine if that difference has meaning or if the variation may be due to chance. Throughout the data section the terms "statistically significant" or "statistically different" will appear to indicate when the number of infections is different in a meaningful way from the number expected on the basis of the national average rate applied to the number of procedures or catheter days.

We use these tests because the national average is really an estimate. NHSN does not capture every infection in every hospital in the United States. In addition, while we try to account for some things that put a patient more at risk for infection, the system does not capture every detail about every person. Each patient and location has a different set of risks that cannot fully be accounted for in the calculation of the SIR. Statistics provide us with some tools to interpret variability. We are able to calculate a range for the SIRs for which we are 95% confident that the true value would fall into if we could take everything into account. We call this a 95% confidence interval. If the value 1 falls within this range, we say that the actual value is not statistically significantly different. If the range does not include 1 then the actual value is statistically significantly different from 1. The 95% confidence interval is largely based on the underlying sample, in this case, the number of central line days or the number of surgeries in a given location. With a larger sample, the confidence interval is narrower because the estimate is based on more observations.

The goal of all hospitals in Massachusetts is zero infections. Some hospital locations have reported no infections during this initial reporting period. There could be many explanations for why other hospitals have reported one or more infections. It may not be due to any different infection control methods used, but rather because of the different types of patients, the conditions for which they are treated, and specialized levels of care required. It is also important to note that the data included in this report was collected over a relatively short time period, and that even a single infection makes a significant impact on the rates reported. One of the next steps for our program is to work with hospitals on validating the data and help them to continue to improve their processes for identifying and reporting infections.

Hospital Characteristics

Seventy-eight Massachusetts hospitals reported data to NHSN in the reporting period, and selected results from the seventy-three acute care sites are reported here. (Hospitals not included in this report do not meet the definition of acute care hospitals; they are state, non-acute facilities or specialty care centers). Most acute care hospitals reporting are general hospitals; two are children's hospitals and one is an orthopedic specialty hospital. The hospitals nearly all operate as not-for-profit; 6 are owned and operated by for-profit organizations (8%). Forty-four percent of the hospitals had at least limited teaching status, with 26% being major teaching hospitals. A major teaching hospital is defined here as a facility that is an important part of the teaching program of a medical school and where the majority of medical students rotate through multiple clinical services. This is an NHSN definition and is different from definitions often used in other contexts.[11]

Nearly half of the hospitals have fewer than 100 beds; 10 have more than 300.

Table 1. Number of Hospitals by Bed Size

Bed Size Category	Number of Hospitals
<100 beds	31
100-199 beds	21
200-299 beds	10
300+ beds	11

A smaller number of beds will result in a smaller number of patient days, which impacts the rates of infection calculated. One additional infection at a hospital with a smaller number of beds will have a much greater impact on infection rate than one additional infection at a larger hospital. This is important to keep in mind when looking at a hospital's data.

Infection Preventionists (IPs)
IPs play a critical role in preventing infections and are part of the team that analyzes the root cause of HAI. As their name suggests, infection preventionists are staff members at hospital facilities, both inpatient and outpatient, who oversee infection prevention and control efforts. They are most commonly nurses, but can also have backgrounds in other areas such as microbiology.

Although the infection prevention and control program guides the effort, reducing the risk of HAIs is a hospital-wide responsibility, requiring teamwork and a multidisciplinary approach. Preventing HAIs must be a hospital priority and part of the overall institutional commitment to improvement including senior leadership involvement to ensure the allocation of resources to address HAIs.

The expert panel reviewed infection preventionist staffing and noted that the number of beds per infection preventionist at that time was higher than a recent national report's suggested ratio of 125 beds per infection control preventionist. Particularly in the larger hospitals, the number of beds per infection preventionist remains higher than these recommendations.

[11] http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF

Table 2: Beds per 1 Full Time Equivalent (FTE) of Infection Preventionists by Bed Size Category

Bed size category	Beds per 1 FTE Infection Preventionist			
	Mean	Median	Minimum	Maximum
<100 beds	43	30	7	99
100-199 beds	132	149	28	189
200-299 beds	216	234	101	270
300+ beds	203	164	99	343

Central Line Associated Blood Stream Infection (CLABSI)

A central venous catheter (CVC), sometimes known as a central line, is a special type of flexible tube that is placed into a large vein in the chest, arm, neck or groin and ends at or close to the heart or one of the great vessels. In newborns, the umbilical artery or vein is considered a great vessel. CVCs are used to administer fluids, nutrition, chemotherapy, antibiotics, blood and blood products, to monitor the cardiovascular system, for hemodialysis or to draw blood. They are an essential part of caring for a critically ill person, but their use also potentially places patients at increased risk for serious infections.

Central line associated bloodstream infections (CLABSI) are bloodstream infections occurring in a patient that had a central line within the 48 hour period before the development of the infection.[12] They are sometimes also referred to as a central venous bloodstream infections, or CVC-BSI. CDC provides definitions of three different types of CLABSI, called Criterion 1, Criterion 2, and Criterion 3.

An estimated 248,000 bloodstream infections occur in U.S. hospitals each year.[13] The cost to the healthcare system is approximately $25,000 per episode.[14] CLABSIs can be prevented through proper insertion and care of the central line.

All Massachusetts acute care hospitals are required to monitor and report CLABSIs occurring in all patients receiving treatment in ICUs. Patients requiring intensive care are usually sicker, require complex treatment and are at highest risk for HAI. [15]

There are many different types of ICUs, each with different types of patients. Not all hospitals have each type of ICU. Examples include medical, cardiac, trauma, and neurosurgical. Each type of ICU differs in how frequently they use central lines, which contributes to risk for infection; greater use of central lines means more opportunity for infections to occur in that ICU.

Identifying and classifying CLABSIs can be complex and relies upon the healthcare provider to interpret signs, symptoms, and test results. The definitions and some simple examples follow. Real-life cases are often more complicated. A summary of the definitions can also be found in Appendix E.

[12] http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf
[13] Klevens RM, Edward JR, et al. Estimating Health Care-Associated Infections and Deaths in U.S. hospitals, 2002. Public Health Reports 2007; 122:160-166.
[14] Centers for Disease Control and Prevention. Guidelines for the Prevention of Intravascular Catheter-Related Infections. *MMWR Morb Mortal Wkly Rep.* 2002; 51(RR- 10):3–36.
[15] Klevens RM, Edward JR, et al. Estimating Health Care-Associated Infections and Deaths in U.S. hospitals, 2002. Public Health Reports 2007; 122:160-166.

In a criterion 1 infection, the patient has a recognized "true" pathogen cultured from one or more blood cultures and the organism cultured from blood is not related to an infection at another site.

For example: Mr. Smith is a patient in Hospital A's surgical intensive care unit (ICU) and has a central line in place. Blood is drawn and tested. The results show an infection caused by an organism called *Staphylococcus aureus*, which is a true pathogen. Mr. Smith does not have infection at any other body site. Mr. Smith's case meets all of the requirements for a criterion 1 CLABSI.

Criterion 2: The patient has at least one of the following signs or symptoms: fever >38°C (>100.4°F), chills, or hypotension and signs and symptoms and positive laboratory results are not related to an infection at another site, with a common skin microorganism (i.e., diphtheroids [*Corynebacterium spp.*], Bacillus [not *B. anthracis*] spp., *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions.

For example: Ms. Doe is in Hospital B's medical ICU. She has a central line in place. She has a fever of 101^{o}F (38. 3°C). Blood is drawn and tested. The results show *Staph coag negative* in the blood. This organism is normally found on the skin, but has the potential to cause infections. In order to see if this might be a criterion 2 infection, one day later more blood is drawn and tested. The second blood sample also finds *Staph coag negative*. She has no other infections at other sites. Ms. Doe now meets the definition of a criterion 2 infection.

As you can see, Ms. Doe has an organism in her blood that is normally found on the skin. She was required to have two blood cultures, in order to be sure that the blood sample was not contaminated when it was being collected.

Criterion 3 characteristics are similar to criterion 2 infections, but apply only to patients less than 1 year of age. The patient must have has at least one of the following signs or symptoms: fever (>100.4^{o}F core), hypothermia (96.8^{o}F core), apnea, or bradycardia. The signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (i.e., diphtheroids [*Corynebacterium* spp.], *Bacillus* [not *B. anthracis*] spp., *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions.

In this report, criterion 1 CLABSIs are presented separately, as well as part of the total CLABSI reporting. The initial recommendation of the HAI Expert Panel was to report criterion 1 for public reporting, as the definition is the most easily applied across hospitals and there is less room for mis-classification of infections.

When Massachusetts CLABSI rates are compared to national rates, they are statistically lower in the most common types of ICUs, both in an all-criteria comparison and a criterion 1 only comparison.

Table 3: Massachusetts Criterion 1, 2, and 3 CLABSI Rates Compared to National Rates, by ICU Type

ICU type	Number of Locations	All Criteria BSI	BSI per 1,000 Central Line Days	National Rate	SIR	Compared to National Rate
Burn	2	11	5.06	5.5	0.92	Statistically No Different
Medical all others	2	0	0.00	1.9	0.00	Statistically No Different
Medical cardiac	13	19	1.18	2	0.59	Statistically Lower
Medical major teaching	14	59	1.77	2.6	0.68	Statistically Lower
Medical/surgical all others	46	41	1.00	1.5	0.67	Statistically Lower
Medical/surgical major teaching	9	16	0.95	2.1	0.45	Statistically Lower
Neurosurgical	2	6	1.21	2.5	0.48	Statistically No Different
Pediatric cardiothoracic	1	27	4.59	3.3	1.39	Statistically No Different
Pediatric medical	1	1	1.17	1.3	0.9	Statistically No Different
Pediatric medical/surgical	6	21	2.62	3	0.87	Statistically No Different
Surgical	14	36	1.19	2.3	0.52	Statistically Lower
Surgical cardiothoracic	10	13	0.57	1.4	0.41	Statistically Lower
Trauma	3	7	1.25	3.6	0.35	Statistically Lower

Table 4: Massachusetts Criterion 1 CLABSI Rates Compared to National Rates, by ICU Type

ICU type	Number of Locations	Criterion 1 BSI	BSI per 1,000 Central Line Days	National Rate	SIR	Compared to National Rate
Medical/surgical non major teaching	46	31	0.76	1.1	0.69	Statistically Lower
Medical major teaching	14	44	1.32	2.2	0.60	Statistically Lower

ICU type	Number of Locations	Criterion 1 BSI	BSI per 1,000 Central Line Days	National Rate	SIR	Compared to National Rate
Surgical	14	10	0.33	1.9	0.17	Statistically Lower
Medical cardiac	13	12	0.74	1.6	0.47	Statistically Lower
Surgical cardiothoracic	10	11	0.49	1.1	0.44	Statistically Lower
Medical/surgical major teaching	9	10	0.59	1.6	0.37	Statistically Lower
Pediatric medical/surgical	6	16	2.00	2.4	0.83	Statistically No Different
Trauma	3	3	0.54	3.1	0.17	Statistically Lower
Burn	2	10	4.60	4.8	0.96	Statistically No Different
Medical all others	2	0	0.00	1.5	0.00	Statistically No Different
Neurosurgical	2	4	0.81	1.9	0.42	Statistically No Different
Pediatric cardiothoracic	1	24	4.08	2.9	1.41	Statistically No Different
Pediatric medical	1	0	0.00	1.2	0.00	Statistically No Different

CLABSI Rates

Table 5 shows the hospital-specific SIRs for criterion 1, 2 and 3 bloodstream infections in specific types of ICUs, by hospital. Only the rates that are significantly different from the national rates are shown. All other hospitals had ICUs with infection rates not significantly different from the national rates (confidence interval of SIR includes 1.00). SIRs are calculated with the expected number of infections based on hospitals and ICUs of the same type (bed size, teaching status, etc; medical, surgical, medical-surgical, etc.)[16].

$$\text{Standardized Infection Ratio (SIR)} = \frac{\text{Actual Number of Events}}{\text{Expected Number of Events}}$$

[16] All 'national data' for comparison is from the "National Healthcare Safety network (NHSN) report: Data summary for 2006 through 2008, issued December 2009" www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.pdf

Table 5: Criterion 1, 2 and 3 CLABSI Infection Rates Significantly Different From National Rates[17]

Hospital	ICU type	BSI Rate per 1,000 Central Line Days (A)	National Rate for Comparable ICU (B)	SIR (A/B)	Compared to National Rate
Boston Medical Center	Medical cardiac	0.32	2.0	0.16	Statistically Lower
Boston Medical Center	Surgical	0.56	2.3	0.25	Statistically Lower
Boston Medical Center	Trauma	0.90	3.6	0.25	Statistically Lower
Brigham and Women's Hospital	Surgical cardiothoracic	0.18	1.4	0.13	Statistically Lower
Brigham and Women's Hospital	Surgical	0.97	2.3	0.42	Statistically Lower
Massachusetts General Hospital	Medical cardiac	0.49	2.0	0.24	Statistically Lower
Massachusetts General Hospital	Surgical cardiothoracic	0.23	1.4	0.16	Statistically Lower
Massachusetts General Hospital	Neurosurgical	0.00	2.5	0.00	Statistically Lower
Massachusetts General Hospital	Surgical	0.41	2.3	0.18	Statistically Lower
Saint Vincent Hospital	Medical/surgical major teaching	0.00	2.1	0.00	Statistically Lower
UMass Memorial Medical Center	Medical major teaching	1.42	2.6	0.55	Statistically Lower
UMass Memorial Medical Center	Surgical	0.54	2.3	0.23	Statistically Lower

A table showing a comparison of all BSI rates for all hospitals and ICU types to national rates is in Appendix G.

Table 6 shows the hospital-specific SIRs for criterion 1 bloodstream infections in specific types of ICUs. Only the rates that are significantly different from the national rates are shown. All other hospitals had ICUs with infection rates not significantly different from the national rates (confidence interval of SIR includes 1.00). SIRs are calculated with the expected based on hospitals and ICUs of the same type (bed size, teaching status, etc; medical, surgical, medical-surgical, etc.)

[17] Locations with <=12.5 patient days or central line days are excluded from the analysis (this results in one location being excluded)

Table 6: Criterion 1 CLABSI Infection Rates Significantly Different From National Rates[18,19]

Hospital	ICU type	Criterion 1 BSI Rate per 1,000 Central Line Days (A)	National Rate (B)	SIR (A/B)	Compared to National Rate
Boston Medical Center	Surgical	0.28	1.9	0.15	Statistically Lower
Brigham and Women's Hospital	Surgical cardiothoracic	0.18	1.1	0.16	Statistically Lower
Brigham and Women's Hospital	Medical major teaching	0.71	2.2	0.32	Statistically Lower
Brigham and Women's Hospital	Surgical	0.19	1.9	0.10	Statistically Lower
Caritas Carney Hospital	Medical/surgical non major teaching	5.12	1.1	4.65	Statistically Higher
Lahey Clinic	Medical major teaching	0.68	2.2	0.31	Statistically Lower
Lahey Clinic	Surgical	0.48	1.9	0.25	Statistically Lower
Massachusetts General Hospital	Medical cardiac	0.24	1.6	0.15	Statistically Lower
Massachusetts General Hospital	Neurosurgical	0.00	1.9	0.00	Statistically Lower
Massachusetts General Hospital	Surgical	0.20	1.9	0.11	Statistically Lower
Saint Vincent Hospital	Medical/surgical major teaching	0.00	1.6	0.00	Statistically Lower
UMass Memorial Medical Center	Medical major teaching	1.20	2.2	0.55	Statistically Lower
UMass Memorial Medical Center	Surgical	0.00	1.9	0.00	Statistically Lower
UMass Memorial Medical Center	Trauma	0.00	3.1	0.00	Statistically Lower

Massachusetts hospital infection rates generally compare well with national rates. Only one Massachusetts hospital had a higher infection rate than the national rate. The statistical methods used, and tests of statistical significance, are only intended for comparisons of a hospital to the national rate, not of one hospital to another.

A table showing criterion 1 BSI rates for all hospitals and ICU types to national rates is in Appendix H.

[18] Locations with <=12.5 patient days or central line days are excluded from the analysis (this results in one location being excluded)
[19] All 'national data' for comparison is from the "National Healthcare Safety Network (NHSN) report: Data summary for 2006 through 2008, issued December 2009" www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.pdf

Central Line Utilization

Without taking into account a hospital's use of central lines, looking at a hospital's infection data can be misleading. The use of central lines varies among different types of ICUs. The following chart shows the number of days central lines were used in different types of ICUs, compared to the total number of patient days, which gives the central line utilization ratio.

$$\frac{\text{Total Central Line Days}}{\text{Total Patient Days}} = \text{Central Line Utilization Ratio}$$

Hospitals with higher central line utilization ratios use central lines more than hospitals with lower ratios. This can be due to a variety of factors, including the types of patients cared for in that hospital unit. With more line days, there are more chances for their patients to get an infection. Appendix I contains hospital-specific central line utilization ratios.

Table 7: Central Line Utilization Ratio by ICU Type – Massachusetts Acute Care Hospitals

Type of ICU	Number of Hospitals With This ICU Type	Total Central Line Days (A)	Total Patient Days (B)	Central Line Utilization Ratio (A/B)
Medical/Surgical, non major teaching	46	40,809	103,053	0.40
Medical major teaching	14	33,327	50,530	0.66
Surgical	14	30,280	46,756	0.65
Medical cardiac	13	16,120	30,185	0.53
Surgical cardiothoracic	10	22,613	28,769	0.79
Medical/surgical major Teaching	9	16,921	31,954	0.53
Pediatric medical/surgical	6	8,003	17,684	0.45
Trauma	3	5,586	11,081	0.50
Burn	2	2,172	2,317	0.94
Medical, not major teaching	2	1,871	3,919	0.48
Neurosurgical	2	4,968	11,813	0.42
Pediatric cardiothoracic	1	5,877	7,964	0.74
Pediatric medical	1	855	2,965	0.29

Pathogens causing CLABSIs

Pathogens are the microorganisms that cause infection. They can be viruses, bacteria, or other microorganisms. A few key pathogens have been identified as the causes of most of the CLABSIs occurring in Massachusetts hospitals. Nearly half of the infections are caused by coagulase negative *Staphylococcus* (CoNS) and *Enterococcus spp*. Although CoNS is identified as the most common

pathogen for CLABSI, it is important to know that CoNS is normally found on the skin and could contaminate the blood sample when it is drawn.

Table 8: Pathogens Identified as Causing Reported Bloodstream Infections – All Criteria

Pathogen	Number of Infections	Percent of Total Infections
Coagulase–negative *Staphylococcus*	85	33%
Enterococcus sp.	44	17%
Gram-negative bacteria	43	17%
Yeasts	38	15%
Methicillin-resistant *Staphylococcus aureus* (MRSA)	20	8%
Staphylococcus aureus (not MRSA)	14	6%
Multiple organisms	8	3%
Lactobacillus sp.	2	1%
Bacillus sp.	1	0%
Fungi (not yeast)	1	0%
Streptococci (other than *Enterococcus* sp.)	1	0%
Total	**257**	**100%**

Neonatal Intensive Care Units (NICUs)

Neonatal intensive care units (NICUs) care for premature or seriously ill newborns. Additional specific measures are collected for NICUs, including birth weight, to help better reflect the potential reasons for differences in infection rates. NICU type is a self-designated categorization chosen by hospitals when they first joined NHSN. This designation was based on definitions of NICU level provided by CDC that were found to be interpreted differently by different hospitals, and that have since been clarified. According to the updated CDC definitions, and according to MDPH regulations, all NICUs listed in this report are considered level III. For the NHSN definitions of NICU levels, see Appendix J.

As with other types of ICUs, it is important to consider the central line utilization ratio. Without taking into account the hospital's use of central lines, looking at a hospital's infection data can be misleading. Hospitals using central lines more frequently have more opportunity for a CLABSI to occur.

$$\text{Central Line Utilization Ratio} = \frac{\text{Total Central Line Days}}{\text{Total Patient Days}}$$

Table 9: Neonatal Intensive Care Unit (NICU) Central Line Utilization

Hospital	NICU type	Central Line Days (A)	Patient days (B)	Central Line Utilization Ratio (A/B)
Beth Israel Deaconess Medical Center	Level II/III	1,908	13,657	0.14
UMass Memorial Medical Center	Level II/III	2,285	12,381	0.18
Baystate Medical Center	Level III	1,980	7,203	0.27

Hospital	NICU type	Central Line Days (A)	Patient days (B)	Central Line Utilization Ratio (A/B)
Boston Medical Center	Level III	875	4,386	0.20
Brigham and Women's Hospital	Level III	2,144	17,333	0.12
Children's Hospital Boston	Level III	2,884	7,340	0.39
Massachusetts General Hospital [20]	Level III	949	2,708	0.35
South Shore Hospital	Level III	669	2,433	0.27
St. Elizabeth's Medical Center	Level III	474	3,536	0.13
Tufts Medical Center	Level III	3,704	11,666	0.32

The central line utilization ratios in NICUs range from 0.12 to 0.39. This may reflect the seriousness of the patient's conditions and types of treatments patients require or the variations may be due to differences in NICU infant populations, so this information should not be used to compare hospitals to one another. Since all patient days are the denominator, Massachusetts NICUs have large variability around which types of babies they admit (e.g. some NICUs admit all well infants <36 weeks gestation, or well infants with a peripheral IV for antibiotics while other NICUs never admit infants in these categories if the babies are well). Obviously this would affect device utilization if the patient days are increased by adding well infants who never require a central line.

Table 10 shows the SIR for NICUs in individual hospitals.

$$\text{Standardized Infection Ratio (SIR)} = \frac{\text{Actual Number of BSI per 1,000 central line days}}{\text{Expected Number of BSI per 1,000 central line days}}$$

In this case, the SIR is the actual number of criterion 1, 2 and 3 BSI divided by the expected number of all Criterion BSI per 1,000 central line days, based on national averages.

Table 10: Neonatal Intensive Care Unit (NICU) Criteria 1, 2 and 3 BSI SIRs

Hospital	NICU type	Criterion 1, 2 and 3 BSI per 1,000 Central Line Days	Number of Infections (A)	Expected Number of Infections (B)	SIR (A/B)	Compared with National Rate
Beth Israel Deaconess Medical Center	Level II/III	2.62	5	6.09	0.82	Statistically No Different
UMass Memorial Medical Center	Level II/III	3.06	7	5.91	1.19	Statistically No Different
Baystate Medical Center	Level III	0.51	1	4.12	0.24	Statistically No Different

[20] Please note MGH did not report NICU data via NHSN until January 2009. The hospital reported the occurrence of two CLABSIs during the period of 7-08 through 12-08.

Hospital	NICU type	Criterion 1, 2 and 3 BSI per 1,000 Central Line Days	Number of Infections (A)	Expected Number of Infections (B)	SIR (A/B)	Compared with National Rate
Boston Medical Center	Level III	5.71	5	1.71	2.92	Statistically No Different
Brigham and Women's Hospital	Level III	3.26	7	4.5	1.56	Statistically No Different
Children's Hospital Boston	Level III	0.69	2	5.84	0.34	Statistically No Different
Massachusetts General Hospital[21]	Level III	0	0	1.77	0.00	Statistically No Different
South Shore Hospital	Level III	0	0	1.22	0.00	Statistically No Different
St. Elizabeth's Medical Center	Level III	0	0	0.96	0.00	Statistically No Different
Tufts Medical Center	Level III	3.51	13	7.88	1.65	Statistically No Different

Criteria 1, 2,and 3 BSIs are shown by birth weight in Appendix K.

Table 11: Neonatal Intensive Care Unit (NICU) Criterion 1 BSI SIR

Hospital	NICU type	Criterion 1 BSI per 1,000 Central Line Days	Number of Infections (A)	Expected Number of Infections (B)	SIR (A/B)	Compared with National Rate
Beth Israel Deaconess Medical Center	Level II/III	2.62	5	4.81	1.04	Statistically No Different
UMass Memorial Medical Center	Level II/III	1.75	4	5.35	0.75	Statistically No Different
Baystate Medical Center	Level III	0.51	1	5.30	0.19	Statistically No Different
Boston Medical Center	Level III	2.29	2	2.19	0.91	Statistically No Different
Brigham and Women's Hospital	Level III	1.87	4	5.79	0.69	Statistically No Different

[21] Please note MGH did not report NICU data via NHSN until January 2009. The hospital reported the occurrence of two CLABSIs during the period of 7-08 through 12-08.

Hospital	NICU type	Criterion 1 BSI per 1,000 Central Line Days	Number of Infections (A)	Expected Number of Infections (B)	SIR (A/B)	Compared with National Rate
Children's Hospital Boston	Level III	0	0	7.46	0.00	Statistically Lower
Massachusetts General Hospital[22]	Level III	0	0	2.34	0.00	Statistically No Different
South Shore Hospital	Level III	0	0	1.58	0.00	Statistically No Different
St. Elizabeth's Medical Center	Level III	0	0	1.27	0.00	Statistically No Different
Tufts Medical Center	Level III	3.24	12	10.16	1.18	Statistically No Different

Only Children's Hospital's SIR is significantly different than the national rate, and it is statistically lower.

Criterion 1 BSIs are shown by birth weight group in Appendix L.

Pathogens
CLABSIs in NICUs resulted from the following organisms.

Table 12: Pathogens Identified in NICU CLABSI

Pathogen	Number of Infections	Percent of Total Infections
Staphylococcus aureus (not MRSA)	15	38%
Coagulase-negative Staphylococcus	12	30%
Yeasts	5	13%
Enterococcus	3	8%
Gram–negative bacteria	3	8%
Methicillin-resistant *Staphylococcus aureus* (MRSA)	2	5%
Total	**40**	**102%[23]**

Nearly 70 percent of CLABSIs in NICUs are caused by *Staphylococcus aureus* and coagulase-negative *Staphylococcus* sp.

[22] Please note, MGH did not report NICU data via NHSN until January 2009. The hospital reported the occurrence of two CLABSIs during the period of 7-08 through 12-08.
[23] Does not total 100% due to rounding

Surgical Site Infections (SSIs)

Surgical site infections (SSIs) are infections that are directly related to an operative procedure. SSIs develop within thirty days after an operation or within one year if an implant was placed and the infection appears to be related to the surgery.[24] Some SSIs are less serious and only involve the skin or subcutaneous tissue. Other SSIs may be deeper and are more significant. Deep incisional and organ/space SSIs result in the greatest personal cost for patients and families, and additional financial burden on the health care system. For this reason, acute care hospitals are required to report to MDPH deep incisional HAIs and infections that affect body organs or spaces. For more detail about of how SSIs are classified, please see Appendix M.

More than half of SSIs are not identified until patients are discharged from the hospital and patients with infection do not always return to the same hospital where the original surgery was performed. Making identification of SSIs even more complex is that infections associated with implants can occur a considerable time after surgery (up to one year). To identify infections after discharge and prevent underestimations of SSIs, hospital infection control programs routinely conduct a process known as post discharge surveillance. Although there is no standard way to obtain this information, hospitals use various approaches, including review of data sources for re-admission and emergency room visits, to improve the detection of SSIs. All patients who experience infections may not be re-admitted or go to the hospital's emergency department, so there may be some infections that will not be identified by the hospital's reporting system.

For this report, HAIs related to coronary artery bypass graft (CABG) surgery (both with and without the harvest of a blood vessel in the lower extremity) and hysterectomy (both vaginal and abdominal) are reported in the aggregate. In the next annual report, the MDPH anticipates having hospital-specific data for these measures.

Important data note: CABG and hip and knee arthroplasty HAIs

The CABG, hip arthroplasty and knee arthroplasty SSI data represent 7 months of surgical procedures, as in these cases, there has been a full year of follow-up for SSIs with implant.

Once the year of observation has occurred for all procedures done between July 2008 and June 2009 and appropriate data analysis has been performed, the MDPH will post data on all of the CABG procedures and hip and knee arthroplasty HAIs through June 2009. This is currently anticipated to be available in September 2010.

Coronary artery bypass graft (CABG)

CABG surgery, commonly called "bypass surgery", improves blood flow to the heart. This procedure is one treatment used for people with narrowing and blockage of the heart arteries. During CABG surgery, a healthy vein or artery usually taken from the patient's own blood vessels in the leg, arm or chest is connected or grafted to the blocked coronary artery. The graft allows blood to go around or "bypass" the blocked section of the coronary artery creating a new route to deliver oxygen and nutrients to the heart muscle. The wires used to close the incision stay in the patient's body permanently and for the purpose of NHSN are considered an implant. Procedures with implants are monitored for infection for one year.

[24] Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, the Hospital Infection Control Practices Advisory Committee. Guideline for the Prevention of Surgical Site Infection, 1999. Infect Control Hosp Epidemiol. 1999; 20:247-278. http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/SSI.pdf

CABG surgery is specialized and only 14 Massachusetts hospitals currently perform these procedures. The patient population represented in this report consists of all patients undergoing CABG surgery requiring an implant in Massachusetts adult acute care non-federal hospitals in the period July 1, 2008 through January 31, 2009.

There are two types of CABG surgery categorized in NHSN. "CBGB" surgery is one in which there are incisions made both in the chest and the "donor site" (the leg, arm, etc). "CBGC" surgery is one in which there is only an incision in the chest. There are 24 HAIs related to CABG surgery reported in this period.

The expected number of events is calculated using CDC national rates for these infections and applying them to the number of procedures performed by the hospitals. Patients are grouped by the number of risk factors they have (0-3).[25]

Table 13: Surgical Site Infection Rate: CABG Surgery in MA Hospitals, July 1, 2008 – January 31, 2009[26]

Type of Surgery	Number of Risk Factors[27]	Number of Hospitals Performing	Number of Procedures	Number of Infections (A)	National Rate (CDC)	Number of Expected Infections (B)	SIR (A/B)	Compared to National Rate
CBGB	0-1	14	1,260	21	0.025	31.6	0.66	Not Statistically Different
CBGB	2-3	14	902	9	0.049	44.0	0.20	Statistically Lower
CBGC	0-3	12	500	3	0.016	7.95	0.38	Not Statistically Different

CBGB = incisions made both in the chest and the "donor site"
CBGC = only an incision in the chest

Massachusetts hospitals' infection rates for CBGB patients with 2-3 risk factors are statistically lower than the national rates (the difference is statistically significant, with the upper confidence interval of the SIR not including 1.00).

Hysterectomy (Vaginal and Abdominal)

Vaginal hysterectomy (VHYS) is a surgical procedure where the uterus is removed through an incision made within the vagina leaving no visible scar. Abdominal hysterectomy (HYST) is the surgical removal of the uterus through an incision in the abdominal wall. Infections related to hysterectomy can be detected for up to 30 days. There are 66 HAIs related to both types of hysterectomy surgery reported in this period.

[25] The risk factors used by the CDC are an ASA (American Society of Anesthesiologists) score higher than 3, a wound class classified as contaminated or dirty, and duration of surgery longer than the national mean time for this surgery. http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf

[26] These infections represent only those reported in the first seven months of the time period, as a full year of follow-up data is available for these procedures. The Department will post revised numbers showing all HAIs reported through June 30, 2009 in September 2010, as soon as the full year of follow-up data is available.

[27] The risk factors used by the CDC are an ASA (American Society of Anesthesiologists) score higher than 3, a wound class classified as contaminated or dirty, and duration of surgery longer than the national mean time for this surgery. http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf

Table 14: Surgical Site Infection Rate: Hysterectomy Surgery in MA Hospitals, July 1, 2008 – June 30, 2009

Type of Surgery	Number of Risk Factors[28]	Number of Hospitals Performing	Number of Procedures	Number of Infections (A)	National Rate (CDC)	Number of Expected Infections (B)	SIR (A/B)	Compared to National Rate
HYST	0	60	3,204	16	0.011	35.2	0.45	Statistically Lower
HYST	1	57	2,181	20	0.022	48.0	0.42	Statistically Lower
HYST	2-3	38	395	6	0.041	16.0	0.38	Statistically Lower
VHYS	0	55	1,399	10	0.007	10.2	0.98	Not Significantly Different
VHYS	1-3	56	1,052	14	0.012	12.2	1.15	Not Significantly Different

HYST = Abdominal Hysterectomy
VHYS = Vaginal Hysterectomy

Massachusetts hospital deep tissue and organ space SSI rates for abdominal hysterectomy were statistically lower than the national rate; rates for vaginal hysterectomy procedures were not significantly different.

Hip and Knee Arthroplasty

Hip arthroplasty is surgery to the hip joint where the diseased or damaged hip joint is removed and replaced with an artificial implant called a prosthesis. Knee arthroplasty is a surgical procedure where the diseased or damaged part of the knee is removed and replaced with a prosthesis.

There are 78 HAIs related to hip and knee arthroplasty reported during their reporting period (July 2008 through January 2009).

[28] The risk factors used by the CDC are an ASA (American Society of Anesthesiologists) score higher than 3, a wound class classified as contaminated or dirty, and duration of surgery longer than the national mean time for this surgery. http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf

Table 15: Surgical Site Infection Rate: Hip and Knee Arthroplasty, July 1, 2008 – January 31, 2009[29]

Type of Surgery	Number of Risk Factors[30]	Number of Hospitals Performing	Number of Procedures	Number of Infections (A)	National Rate (CDC)	Number of Expected Infections (B)	SIR (A/B)	Compared to National Rate
HPRO	0	62	1,874	5	0.007	12.56	0.40	Statistically Lower
HPRO	1	66	2,959	21	0.014	42.61	0.49	Statistically Lower
HPRO	2-3	57	800	14	0.024	19.20	0.73	Not Statistically Different
KPRO	0	57	2,970	8	0.006	17.23	0.46	Statistically Lower
KPRO	1	65	3,297	17	0.010	32.64	0.52	Statistically Lower
KPRO	2-3	61	960	13	0.016	15.36	0.85	Not Statistically Different

HPRO = Hip Arthroplasty
KPRO = Knee Arthroplasty

These rates and SIRs are calculated on the basis of data available as of the writing of this report. Revised rates and SIRs will be posted when further data are available (see footnote 29). These updated rates and SIRs will almost certainly be somewhat different from those reported here, as more complete information will be available at that time.

Massachusetts hospital deep infection SSI rates are statistically below the rates that would be expected for both hip and knee arthroplasty, based on national rates for these procedures (the upper confidence interval of the SIR not including 1.00. Only the knee and hip arthroplasty SSI rate for patients with 2-3 risk factors were not statistically significantly different from the national rate.

Hip Arthroplasty HAIs

Table 16: Hip Arthroplasty Surgical Site Infections Compared to Expected Infections

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Anna Jaques Hospital	45	2	0.57	3.51	Not Statistically Different
Berkshire Health Systems	86	3	1.09	2.75	Not Statistically Different

[29] These infections represent only those reported in the first seven months of the time period, as a full year of follow-up data is not available for these procedures. The Department will post revised numbers showing all HAIs reported through June 30, 2009 in September 2010, as soon as the full year of follow-up data is available.
[30] The risk factors used by the CDC are an ASA (American Society of Anesthesiologists) score higher than 3, a wound class classified as contaminated or dirty, and duration of surgery longer than the national mean time for this surgery. http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Beth Israel Deaconess Medical Center	143	3	1.81	1.66	Not Statistically Different
Boston Medical Center	93	2	1.18	1.69	Not Statistically Different
Brigham and Women's Hospital	323	2	4.09	0.49	Not Statistically Different
Holyoke Medical Center	31	1	0.39	2.55	Not Statistically Different
Lahey Clinic	203	1	2.57	0.39	Not Statistically Different
Lowell General Hospital	52	2	0.66	3.04	Not Statistically Different
Massachusetts General Hospital	274	2	3.47	0.58	Not Statistically Different
Merrimack Valley Hospital	23	1	0.29	3.43	Not Statistically Different
Metro West Medical Center-Framingham Hospital	21	2	0.27	7.52	Not Statistically Different
Metro West Medical Center-Leonard Morse Hospital	32	1	0.41	2.47	Not Statistically Different
New England Baptist Hospital	1,092	1	13.83	0.07	Statistically Lower
Newton-Wellesley Hospital	265	2	3.36	0.59	Not Statistically Different
North Shore Medical Center - Salem Hospital	107	2	1.35	1.48	Not Statistically Different
Northeast Hospital – Beverly Hospital	110	1	1.39	0.72	Not Statistically Different
Quincy Medical Center	53	1	0.67	1.49	Not Statistically Different
Saint Vincent Hospital	163	4	2.06	1.94	Not Statistically Different
Southcoast Health Systems - Charlton Hospital	99	2	1.25	1.59	Not Statistically Different
St. Elizabeth's Medical Center	38	1	0.48	2.08	Not Statistically Different
UMass Memorial Medical Center	312	3	3.95	0.76	Not Statistically Different
Winchester Hospital	60	1	0.76	1.32	Not Statistically Different

Only New England Baptist had hip arthroplasty SSI infection rates that were statistically different from the national data, statistically lower. Hospitals not listed in this chart did not report any infections during this reporting period.

Some hospitals performed hip arthroplasty surgery and had no SSIs during the reporting period. The number of surgeries performed and the expected number of infections based on national rates is found in Table 17**.** The number of procedures performed by these hospitals ranged from 1 to 262.

Table 17: Hospitals with No Hip Arthroplasty Infections. July 2008 – January 2009

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Baystate Medical Center	262	0	3.32	0.00	Not Statistically Different
South Shore Hospital	143	0	1.81	0.00	Not Statistically Different
Cape Cod Hospital	125	0	1.58	0.00	Not Statistically Different
Mount Auburn Hospital	125	0	1.58	0.00	Not Statistically Different
Southcoast Health Systems -- St. Luke's Hospital	90	0	1.14	0.00	Not Statistically Different
Falmouth Hospital	83	0	1.05	0.00	Not Statistically Different
Caritas Holy Family Hospital	81	0	1.03	0.00	Not Statistically Different
North Shore Medical Center - Union Hospital	81	0	1.03	0.00	Not Statistically Different
Jordan Hospital	65	0	0.82	0.00	Not Statistically Different
Caritas Good Samaritan Medical Center	62	0	0.79	0.00	Not Statistically Different
Tufts Medical Center	62	0	0.79	0.00	Not Statistically Different
Cooley Dickinson Hospital	57	0	0.72	0.00	Not Statistically Different
Caritas Norwood Hospital	53	0	0.67	0.00	Not Statistically Different
Emerson Hospital	53	0	0.67	0.00	Not Statistically Different
Hallmark Health Corp- Melrose-Wakefield	53	0	0.67	0.00	Not Statistically Different
Milford Regional Hospital	43	0	0.54	0.00	Not Statistically Different
Brockton Hospital (Signature)	41	0	0.52	0.00	Not Statistically Different
Sturdy Memorial Medical Center	40	0	0.51	0.00	Not Statistically Different
Faulkner	36	0	0.46	0.00	Not Statistically Different
Saints Memorial Medical Center	35	0	0.44	0.00	Not Statistically Different

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Morton Hospital and Medical Center	32	0	0.41	0.00	Not Statistically Different
Nthern Berkshire Health Sys (North Adams Reg Hos)	32	0	0.41	0.00	Not Statistically Different
St. Anne's Hospital	31	0	0.39	0.00	Not Statistically Different
Mercy Medical Center	30	0	0.38	0.00	Not Statistically Different
Beth Israel Deaconess Medical Center Needham	28	0	0.35	0.00	Not Statistically Different
Marlborough Hospital	28	0	0.35	0.00	Not Statistically Different
Lawrence General Hospital	24	0	0.30	0.00	Not Statistically Different
Cambridge Health Alliance - Cambridge Hospital	23	0	0.29	0.00	Not Statistically Different
Caritas Carney Hospital	23	0	0.29	0.00	Not Statistically Different
Franklin Medical Center	23	0	0.29	0.00	Not Statistically Different
Health Alliance Hospital	21	0	0.27	0.00	Not Statistically Different
Lawrence Memorial Hospital	20	0	0.25	0.00	Not Statistically Different
Milton Hospital	20	0	0.25	0.00	Not Statistically Different
Southcoast Health Systems -- Tobey Hospital	16	0	0.20	0.00	Not Statistically Different
Cambridge Health Alliance - Whidden Memorial Hospital	11	0	0.14	0.00	Not Statistically Different
Heywood Hospital	9	0	0.11	0.00	Not Statistically Different
Noble Hospital	9	0	0.11	0.00	Not Statistically Different
Wing Memorial Hospital	8	0	0.10	0.00	Not Statistically Different
Harrington Memorial Hospital	7	0	0.09	0.00	Not Statistically Different
Martha's Vineyard Hospital	7	0	0.09	0.00	Not Statistically Different
Nashoba Valley Medical Center	6	0	0.08	0.00	Not Statistically Different
Fairview	5	0	0.06	0.00	Not Statistically Different
Cambridge Health Alliance - Somerville Hospital	2	0	0.03	0.00	Not Statistically Different

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Northeast Hospital - Addison Gilbert	2	0	0.03	0.00	Not Statistically Different
Athol Hospital	1	0	0.01	0.00	Not Statistically Different

Knee Arthroplasty HAIs

Table 18: Knee Arthroplasty Surgical Site Infections Compared to Expected Infections

New England Baptist Hospital's rate was significantly different from the expected, statistically lower (the upper confidence interval of the SIR not including 1.00). St. Vincent Hospital's rate was significantly different from the expected, statistically higher.

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Anna Jaques Hospital	36	1	0.32	3.11	Not Statistically Different
Beth Israel Deaconess Medical Center	159	2	1.42	1.41	Not Statistically Different
Brigham and Women's Hospital	451	2	4.03	0.50	Not Statistically Different
Brockton Hospital (Signature)	55	1	0.49	2.04	Not Statistically Different
Cambridge Health Alliance - Cambridge Hospital	28	1	0.25	4.00	Not Statistically Different
Caritas Holy Family Hospital	108	1	0.96	1.04	Not Statistically Different
Falmouth Hospital	153	1	1.37	0.73	Not Statistically Different
Lahey Clinic	288	2	2.57	0.78	Not Statistically Different
Lowell General Hospital	76	3	0.68	4.42	Not Statistically Different
Massachusetts General Hospital	274	2	2.45	0.82	Not Statistically Different
Metro West Medical Center-Leonard Morse Hospital	59	1	0.53	1.90	Not Statistically Different
Mount Auburn Hospital	173	1	1.54	0.65	Not Statistically Different
New England Baptist Hospital	1,320	4	11.78	0.34	Significantly Lower

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Newton-Wellesley Hospital	193	1	1.72	0.58	Not Statistically Different
Noble Hospital	26	1	0.23	4.31	Not Statistically Different
North Shore Medical Center - Salem Hospital	159	1	1.42	0.70	Not Statistically Different
Quincy Medical Center	50	1	0.45	2.24	Not Statistically Different
Saint Vincent Hospital	206	6	1.84	3.26	Significantly Higher
South Shore Hospital	153	1	1.37	0.73	Not Statistically Different
Southcoast Health Systems -- Charlton Hospital	160	1	1.43	0.70	Not Statistically Different
Southcoast Health Systems -- St. Luke's Hospital	136	2	1.21	1.65	Not Statistically Different
Tufts Medical Center	51	1	0.46	2.20	Not Statistically Different
Winchester Hospital	131	1	1.17	0.86	Not Statistically Different

Some hospitals performed knee arthroplasty surgeries and had no SSIs during this time period. The number of surgeries performed and the expected number of infections based on national rates is found in Table 19.

Table 19: Hospitals with No Knee Arthroplasty Infections July 2008 – January 2009

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Baystate Medical Center	377	0	3.37	0.00	Not Statistically Different
UMass Memorial Medical Center	290	0	2.59	0.00	Not Statistically Different
Northeast Hospital - Beverly Hospital	176	0	1.57	0.00	Not Statistically Different
Boston Medical Center	138	0	1.23	0.00	Not Statistically Different
Cape Cod Hospital	135	0	1.21	0.00	Not Statistically Different
Faulkner	128	0	1.14	0.00	Not Statistically Different
Jordan Hospital	128	0	1.14	0.00	Not Statistically Different

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
Berkshire Health Systems	112	0	1.00	0.00	Not Statistically Different
Caritas Good Samaritan Medical Center	99	0	0.88	0.00	Not Statistically Different
North Shore Medical Center - Union Hospital	89	0	0.79	0.00	Not Statistically Different
Morton Hospital and Medical Center	86	0	0.77	0.00	Not Statistically Different
Mercy Medical Center	72	0	0.64	0.00	Not Statistically Different
Cooley Dickinson Hospital	58	0	0.52	0.00	Not Statistically Different
Marlborough Hospital	58	0	0.52	0.00	Not Statistically Different
Milford Regional Hospital	57	0	0.51	0.00	Not Statistically Different
St. Elizabeth's Medical Center	57	0	0.51	0.00	Not Statistically Different
Saints Memorial Medical Center	55	0	0.49	0.00	Not Statistically Different
Hallmark Health Corp- Melrose-Wakefield	53	0	0.47	0.00	Not Statistically Different
Caritas Norwood Hospital	52	0	0.46	0.00	Not Statistically Different
Health Alliance Hospital	51	0	0.46	0.00	Not Statistically Different
Sturdy Memorial Medical Center	51	0	0.46	0.00	Not Statistically Different
Emerson Hospital	48	0	0.43	0.00	Not Statistically Different
Heywood Hospital	48	0	0.43	0.00	Not Statistically Different
Holyoke Medical Center	46	0	0.41	0.00	Not Statistically Different
Milton Hospital	44	0	0.39	0.00	Not Statistically Different
Nthern Berkshire Health Sys (North Adams Reg Hos)	36	0	0.32	0.00	Not Statistically Different
Merrimack Valley Hospital	32	0	0.29	0.00	Not Statistically Different
Southcoast Health Systems -- Tobey Hospital	29	0	0.26	0.00	Not Statistically Different
Caritas Carney Hospital	25	0	0.22	0.00	Not Statistically Different

Hospital Name	Total Surgeries	Total Infections (A)	Expected Infections (B)	SIR (A/B)	Compared to National Rate
St. Anne's Hospital	23	0	0.21	0.00	Not Statistically Different
Harrington Memorial Hospital	18	0	0.16	0.00	Not Statistically Different
Metro West Medical Center-Framingham Hospital	18	0	0.16	0.00	Not Statistically Different
Lawrence Memorial Hospital	14	0	0.13	0.00	Not Statistically Different
Fairview	13	0	0.12	0.00	Not Statistically Different
Beth Israel Deaconess Medical Center Needham	12	0	0.11	0.00	Not Statistically Different
Franklin Medical Center	12	0	0.11	0.00	Not Statistically Different
Nashoba Valley Medical Center	11	0	0.10	0.00	Not Statistically Different
Baystate Mary Lane	7	0	0.06	0.00	Not Statistically Different
Lawrence General Hospital	6	0	0.05	0.00	Not Statistically Different
Wing Memorial Hospital	6	0	0.05	0.00	Not Statistically Different
Cambridge Health Alliance - Somerville Hospital	4	0	0.04	0.00	Not Statistically Different
Cambridge Health Alliance - Whidden Memorial Hospital	3	0	0.03	0.00	Not Statistically Different
Martha's Vineyard Hospital	3	0	0.03	0.00	Not Statistically Different
Northeast Hospital - Addison Gilbert	2	0	0.02	0.00	Not Statistically Different

Time to Detection

The time it takes to detect an SSI varies greatly, depending on the type of event. For knee arthroplasty, the average time to detection was nearly 104 days (approximately 3 ½ months). To identify infections after discharge and prevent underestimations of SSIs, hospital infection control programs routinely conduct a process known as post discharge surveillance. Although there is no standard way to this information, hospitals use various approaches, including review of data sources for re-admission and emergency room visits, to improve the detection of SSIs. All patients who experience infections may not be re-admitted or go to the hospital's emergency department, so there may be some infections that will not be identified by the hospital's reporting system.

Table 20: Detection of Surgical Site Infections

Procedure	Events	Average Detection (days)	Range of Days to Detection		When Detected	
			Minimum	Maximum		
CBGB	30	34.63	5	183	During Admission	5
					Post-Discharge Surveillance	1
					Readmission	24
CBGC	3	29	10	50	During Admission	2
					Post-Discharge Surveillance	0
					Readmission	1
VHYS	24	11.21	1	22	During Admission	3
					Post-Discharge Surveillance	3
					Readmission	18
HYST	42	11.24	1	28	During Admission	2
					Post-Discharge Surveillance	7
					Readmission	33
KPRO	38	122.6	1	353	During Admission	0
					Post-Discharge Surveillance	3
					Readmission	35
HPRO	40	57.6	1	324	During Admission	13
					Post-Discharge Surveillance	1
					Readmission	36

Additional Data

Race/Ethnicity Data

Understanding and preventing racial and ethnic disparities in healthcare is a high MDPH priority. The established federal NHSN system has limited ability to collect race and ethnicity data, as those data elements are not required for participation. In order to meet the Massachusetts requirement for submission of data on race and expanded ethnicity, beginning January 1, 2009, all acute care hospitals were mandated to submit this information using custom NHSN fields. Each hospital was required to manually set up and enter all data in the specified custom fields using the MA Division of Health Care Finance and Policy codes. While the initial focus of the quality assurance reports has been to ensure the accuracy of HAI measures at the facility level, the addition of a data manager to the program will assist efforts to evaluate submission of race and ethnicity data.

Current Status of HAI Activities in Massachusetts

Sharing of Best Practices

The HAI Expert Panel recommended a comprehensive set of evidence based prevention guidelines or "best practices" for implementation in Massachusetts hospitals[31]. "Best practices" are strategies, activities or approaches that have been shown through research and evaluation to be effective in reducing the risk of HAI.

Infection Prevention Unit Activities

To actively support the use of the evidence-based best practices, MDPH implemented an Infection Prevention Unit within the Division of Health Care Quality. For its first project, MDPH infection preventionists (IP) with extensive HAI experience developed a detailed on-site survey tool for individual hospital infection prevention programs to use to look at their current programs. The IPs conducted site visits in each acute care hospital to encourage an open discussion on current practices and innovative programs at the hospital. In addition, they provided guidance on implementation of best practices, collection and submission of HAI data, and they addressed programmatic concerns.

In April 2010, the IPs will begin unannounced infection prevention and control focused surveys of all acute care hospitals. They will conduct reviews to verify compliance with regulations, associated guidelines and relevant best practices. If hospitals do not meet established standards for infection prevention they will be required to submit a written plan to MDPH to identify the corrective actions to be taken to address deficient practices.

Education and Training

Support for Hospitals

Before NHSN reporting began, hospitals completed user specific CDC/NHSN training. Additional technical assistance and training on NHSN enrollment procedures, standard definitions and reporting measures has been provided for all hospitals. Ongoing support for hospitals is provided by MDPH staff in consultation with CDC.

Massachusetts Coalition for the Prevention of Medical Errors

MDPH supports the Massachusetts Coalition for the Prevention of Medical Errors (the Coalition) collaborative programming designed to help hospitals in their work to prevent healthcare associated infections (HAIs). Working with the Massachusetts Hospital Association (MHA), MDPH, and the Betsy Lehman Center for Patient Safety, the Coalition's goal has been to enlist 100% of acute care hospitals, and accelerate progress in infection prevention in those hospitals by sharing local and national best practices, tools and resources, and implementation strategies, as well as maintaining top leadership support.

The Coalition has held a number of seminars for professionals on infection prevention and approaches for promoting quality improvement. All hospitals participated in one or more of these trainings. Programs were also developed to ensure senior hospital leadership involvement in this initiative. As a result of these focused meetings senior leaders from all hospitals signed a letter of commitment prioritizing infection prevention for their facility. To promote the sharing of effective strategies the Coalition has published and distributed a collection of 34 successful prevention projects reported by 24 hospitals.[32]

[31] http://www.mass.gov/Eeohhs2/docs/dph/patient_safety/haipcp_final_report_pt1.pdf
http://www.mass.gov/Eeohhs2/docs/dph/patient_safety/haipcp_final_report_pt2.pdf
[32] http://www.macoalition.org/Initiatives/docs/09-27_MACoalition_booklet_web.pdf

The Massachusetts Neonatal Quality Improvement Collaborative
Mass NeoQIC is a statewide quality improvement organization representing neonatologists from all 10 level 3 neonatal intensive care units (NICUs) in Massachusetts. NICUs provide care for newborn infants with extreme prematurity or who are critically ill or require surgical intervention. MassNeoQIC has approached MDPH to work with them in their efforts to reduce preventable infections. MDPH staff will collaborate with MassNeoQIC in identification of best practices, reporting of NICU measures of infection and utilization of the data to improve the care of our smallest and most vulnerable patients.

Consumer Targeted Information
The Partnership for Healthcare Excellence is a broad-based coalition with participants from every segment of the health care community whose aim is to educate and motivate consumers to improve the safety and effectiveness of their own healthcare. Membership includes consumer associations, disease and advocacy organizations, doctors and insurers, business groups, labor, public health advocates and other health care leaders.

In efforts to raise awareness and address the steps consumers can take to reduce infection, MDPH supported public information campaigns conducted by the Partnership for Healthcare Excellence. The Partnership produced a fact sheet accessible online that provides concrete actions to help prevent infection. The fact sheet is also available in Spanish, Portuguese, Vietnamese and Cambodian.[33]

National Efforts to Address HAI
HAI as an emerging public health issue has received increasing attention from the public, healthcare providers, the media and legislators. Although there are many state, federal and private agencies working to prevent the occurrence of HAI, until recently a coordinated national effort had not been developed.

In January 2009, the U.S. Department of Health and Human Services (HHS) published an *Action Plan to Prevent Healthcare-Associated Infections.*[34] The overall goal of the plan is to improve the coordination of federal activities and resources to accelerate and maximize their impact on reducing HAI. The plan establishes five year national goals and outlines an integrated approach to improve the management of HAI initiatives. It identifies prioritized areas for prevention and includes recommendations for research, and the enhanced use and quality of the metrics and supporting systems needed to assess progress towards meeting the targets. Meeting the challenge of HAI prevention will also require effective collaboration with national, state public and private sector partners.

American Recovery and Reinvestment Act of 2009
The American Recovery and Reinvestment Act (ARRA) of 2009, Public Law 111-5 was signed into law on February 17, 2009. The primary purpose of this funding is to promote economic stimulus, maximize job creation, and job retention. In February 2009, the US Department of Health and Human Services (HHS) appropriated $40 million to state health departments for efforts to prevent HAI.

In August, 2009, the Center for Disease Control and Prevention announced the award of a $1.5 million grant to Massachusetts to carry out activities to meet the expectations described in the U.S. Department of Health and Human Services 2009 *Action Plan to Prevent Healthcare-Associated Infections*. This one time only funding to be distributed over a two year period will complement existing state efforts to address HAIs and support the following activities:

[33] http://www.partnershipforhealthcare.org/patients_and_caregivers/preventing_infection/
[34] http://www.hhs.gov/ophs/initiatives/hai/infection.html

- **Coordination and Reporting of State HAI Prevention Efforts**
  MDPH will enhance efforts to coordinate and implement HAI prevention activities and report on progress toward reductions in selected HHS Action Plan Targets. Designation of a dedicated Coordinator who will focus on HAI prevention and development and implementation of the State HAI Plan are new activities under the ARRA funding.
- **Detection and Reporting of HAI Surveillance Data**
  Support for this initiative includes plans to improve the quality of the recently implemented NHSN-based reporting system with data cleaning and validation activities. MDPH is working with JSI Research and Training Institute, Inc., to develop and implement a sustainable system of data validation. In addition, there will be time-phased expansion of metrics tracked in order to ultimately assess progress on 5 of 7 HHS Action Plan Targets. This expansion will be facilitated by enhanced capacity for electronic laboratory reporting (ELR).
- **Establishing a Prevention Collaborative**
  MDPH has partnered with the Massachusetts Coalition for the Prevention of Medical Errors to conduct two collaborative initiatives targeting reductions in central line associated blood stream infection (CLABSI), and multi-drug resistant organisms (MDROs). The comprehensive infection prevention training is intended to promote measureable progress toward the national prevention targets outlined in the HHS Action Plan to Prevent HAIs.

Massachusetts State HAI Action Plan

The 2009 ARRA bill required states receiving funds to certify that they would submit a plan to reduce HAIs to the Secretary of Health and Human Services (HHS) no later than January 1, 2010. As directed, MDPH presented the *Massachusetts State HAI Prevention Plan* to HHS on December 30, 2009. The adoption of a formal plan identifies state level long range prevention targets and is consistent with national five year HHS goals and objectives. The plan was created with input from the TAG. Implementation of the recommendations detailed in the Plan will be reviewed on an ongoing basis. Additional goals, objectives and activities will be developed as areas of need are identified. The plan is available for review on the following website. www.mass.gov/dph/dhcq

To see what other states are planning please access the following clickable map.
http://www.cdc.gov/HAI/recoveryact/map.html