

Introduction

The effect of preventable healthcare-associated infections (HAIs) on patients and families, and the associated cost to the healthcare system, are prominent national and Massachusetts concerns. HAIs are infections that patients acquire within a healthcare setting while receiving treatment for other conditions. HAIs are among the leading causes of preventable death in the United States, affecting 1 in 25 hospitalized patients, accounting for an estimated 722,000 infections and an associated 75,000 deaths during hospitalization.ⁱ These infections not only have a negative personal impact on patients and their families, they also contribute to the nation's escalating healthcare costs. HAIs result in additional costs to the healthcare system that range anywhere from \$28 to 45 billion dollars each year in the United States.ⁱⁱ

Overuse of antibiotics contributes to the problem of HAIs by selecting for the emergence of antibiotic resistant (AR) organisms that cause HAIs and are difficult to treat, limit treatment options and may prolong a patient's length of stay in a healthcare facility. A 2013 CDC report estimated that more than two million people are affected by antibiotic resistant infections annually in the United States, resulting in at least 23,000 deaths. In addition to the effect on human life, antibiotic resistant infections add significant avoidable costs to the overburdened U.S. healthcare system. CDC estimates the annual impact of antibiotic resistant infections on the U.S. economy is \$20 – 35 billion in excess direct healthcare costs, with additional costs to society for lost productivity -- as high as \$35 billion per year with eight million additional hospital days. AR is driven by the appropriate and inappropriate use of antimicrobials for human and animal health, and food production, as well as inadequate measures to control the spread of infection in healthcare settings. Up to 50% of hospitalized patients are on antibiotics,ⁱⁱⁱ and up to 30-50 percent of this antimicrobial use in hospitals is unnecessary and inappropriate^{iv}. This contributes to emergence of resistance in infecting and colonizing microorganisms and also contributes to the growing problem of *Clostridium difficile* infections. A commitment to the responsible use of antibiotics is antimicrobial stewardship.

Improving quality and safety of the care patients receive while reducing cost is one of the leading challenges faced by the American healthcare system. Acknowledging the need for a coordinated, statewide response to HAI, the Massachusetts Department of Public Health established a statewide infection prevention and control program with an emphasis on surveillance, mandatory public reporting of specific measures, support for prevention initiatives, outbreak investigation and the regulatory promotion of adherence to evidence-based best practices. In 2010, DPH developed a comprehensive statewide plan to address HAI. The adoption of the Massachusetts State HAI Prevention Plan identified state –level prevention targets that are consistent with United States Department of Health and Human Services National and goals and objectives.

Advancing the national and state goal of HAI elimination requires acknowledging the many recent MDPH improvements while recognizing that additional work is necessary. The challenges of eliminating HAIs are multi-faceted and ongoing improvement requires coordination of statewide efforts, leveraging current initiatives and expansion of efforts to additional settings of care.

Sustainable success requires working collaboratively with identified local, regional and national partners and engaging new stakeholders with the shared priority of eliminating HAI.

This revision of the 2010 Massachusetts State HAI Prevention Plan* provides an overview of the infection prevention activities that have been accomplished as well as those that are planned for implementation. Activities in the plan are described as underway if DPH is currently addressing them. Activities described as planned are those MDPH would like to undertake contingent upon availability of resources and additional priorities.

*The original Massachusetts Department of Public Health HAI Plan was submitted in December 2009 and is available at: <http://www.mass.gov/eohhs/docs/dph/quality/healthcare/hai-plan-implamentation.pdf>.

1. Enhance HAI program infrastructure

Successful HAI prevention requires close integration and collaboration with state and local infection prevention activities and systems. Consistency and compatibility of HAI data collected across facilities will allow for greater success in reaching state and national goals. Please select areas for development or enhancement of state HAI surveillance, prevention, and control efforts.

Table 1: State infrastructure planning for HAI surveillance, prevention, and control.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Establish statewide HAI prevention leadership through the formation of multidisciplinary group or state HAI advisory council i. Collaborate with local and regional partners (e.g., state hospital associations, professional societies for infection control and healthcare epidemiology, academic organizations, laboratorians, and networks of acute care hospitals and long-term care facilities). The multidisciplinary HAI Technical Advisory Group (TAG) was launched in 2008 and meets quarterly. The TAG is comprised of hospital epidemiologists, infection preventionists, consumers, advocates, academics and representatives from state agencies, professional organizations and trade organizations. The role of the TAG is to provide guidance to MDPH on all issues related to HAI prevention, the results of reports and surveys, the application of surveillance and control methods and the presentation of the results to healthcare providers and the public. A full listing of TAG members and affiliations is found in Appendix 2. All TAG meetings are open to the public.	Ongoing since 2008
☒	☐	ii. NEW: Include hospital preparedness partners (e.g., hospital/healthcare coalitions funded through the ASPR Hospital Preparedness Program). Additional representation from accrediting and/or licensing agency with surveyor authority is ideal. A representative from the MDPH Hospital Preparedness Program has been added to the TAG's membership. The TAG also includes senior staff and other representatives from the	Ongoing since 5/2015

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	MDPH's Bureau of Infectious Disease and Laboratory Sciences and Bureau of Health Care Safety and Quality. MDPH plans to expand the HAI TAG to include representation from additional settings of care including: • Ambulatory Surgical Centers (ASC) • Dialysis Centers • Long Term Acute Care • Nursing Homes iii. NEW: Engage HAI advisory committee in potential roles and activities to improve antibiotic use in the state (antibiotic stewardship) The HAI TAG has been involved at a high level with the planning of antibiotic stewardship activities, including professional development opportunities for microbiologists, physicians and nurses in the state. Additional antibiotic stewardship activities will be developed in consultation with the TAG.	Ongoing since 2008 2016
☒	☐	The HAI TAG will be expanded to include additional members with antibiotic stewardship expertise, including pharmacists, microbiologists and administrators. iv. NEW: Engage HAI advisory committee in activities to increase health department's access to data and subsequently use those data in prevention efforts MDPH has required acute care hospitals to report specific HAI measures to the CDC's National Healthcare Safety Network (NHSN) since 2008. The initial measures were based on the recommendations of an HAI Expert Panel convened by MDPH. The TAG was established in 2008 and provided	2016

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation								
☒	☐	guidance on the expansion of HAI reporting requirements including: - Healthcare personnel (HCP) influenza reporting to NHSN - Requirement for acute care hospitals to report CAUTI, SSI from colon procedures, and facility wide CDI and MRSA Lab ID events The TAG continues to be actively involved in discussions to identify and prioritize HAI prevention targets and data requirements that are consistent with HHS goals and targets. v. Identify specific HAI prevention targets consistent with HHS priorities Initial HHS metrics identified in 2008 included reporting of central line associated blood stream infections (CLABSI) in adult, pediatric and neonatal intensive care units, surgical site infections (SSI) related to abdominal and vaginal hysterectomy procedures, hip and knee arthroplasties and coronary artery bypass graft (CABG) procedures to the Centers for Disease Control and Prevention’s (CDC) National Healthcare Safety Network (NHSN). The following additional reporting requirements were implemented in 2014 and are consistent with current Centers for Medicare and Medicaid Services (CMS) requirements: <table><tr><td>Catheter-associated Urinary Tract Infection (CAUTI)</td><td>Acute Care Hospitals: Adult and Pediatric ICUs</td></tr><tr><td>Surgical Site Infection (SSI)</td><td>Acute Care Hospitals: Inpatient Colon Procedures</td></tr><tr><td>Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) Bacteremia LabID Event</td><td>Acute Care Hospitals: Facility Wide Inpatient</td></tr><tr><td><i>Clostridium difficile</i> Infection (CDI) LabID Event</td><td>Acute Care Hospitals: Facility Wide Inpatient</td></tr></table>	Catheter-associated Urinary Tract Infection (CAUTI)	Acute Care Hospitals: Adult and Pediatric ICUs	Surgical Site Infection (SSI)	Acute Care Hospitals: Inpatient Colon Procedures	Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) Bacteremia LabID Event	Acute Care Hospitals: Facility Wide Inpatient	<i>Clostridium difficile</i> Infection (CDI) LabID Event	Acute Care Hospitals: Facility Wide Inpatient	2008 and ongoing 2014 and ongoing 2008 and ongoing
Catheter-associated Urinary Tract Infection (CAUTI)	Acute Care Hospitals: Adult and Pediatric ICUs										
Surgical Site Infection (SSI)	Acute Care Hospitals: Inpatient Colon Procedures										
Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) Bacteremia LabID Event	Acute Care Hospitals: Facility Wide Inpatient										
<i>Clostridium difficile</i> Infection (CDI) LabID Event	Acute Care Hospitals: Facility Wide Inpatient										

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Starting in 2008, acute care hospitals were required to report healthcare worker influenza vaccination data to MDPH. In 2011, these requirements were extended to ambulatory surgical centers, dialysis centers, long term care facilities and non-acute hospitals; in 2012 rest homes.; 2015 Adult Day Health Centers. Massachusetts acute care hospitals are required to report HCP influenza vaccination summary data to NHSN. Massachusetts ASCs are required to report HCP influenza vaccination summary data to NHSN. Massachusetts dialysis centers and non-acute hospitals are required to report HCP influenza vaccination summary data to NHSN. MDPH will expand acute care hospital reporting requirements to include central line associated blood stream infections for adult and pediatric medical, surgical and medical/surgical wards. MDPH will expand acute care hospital reporting requirements to include catheter associated urinary tract infections for adult and pediatric medical, surgical and medical/surgical wards. MDPH will expand acute care hospital requirements to include the NHSN Antimicrobial Use and Resistance (AUR) Module Selection of additional HHS metrics will be prioritized as directed by CDC, HHS, recommendations of the TAG, identification of emerging HAI issues and based on the experience of other jurisdictions.	2013 and ongoing 2014 and ongoing 2016 and ongoing 2018and ongoing 2014 and ongoing 2017 and ongoing
		<i>Other activities or descriptions:</i>	

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		The immunization of healthcare personnel (HCP) against influenza and the goal of achieving at least 90% coverage is a prioritized MDPH initiative. MDPH requires all licensed healthcare facilities to provide free influenza vaccine and to report HCP influenza vaccination data annually. (See list of MA licensed healthcare facilities at http://www.mass.gov/eohhs/gov/departments/dph/programs/hcq/healthcare-quality/). MDPH requires acute care facilities, licensed clinics and long-term care facilities to provide both seasonal and pandemic H1N1 influenza vaccine to all personnel (broadly defined to include contractors, volunteers and students) free of charge. A “flu summit” for healthcare facility infection control personnel was hosted in to share strategies for increasing and maintaining HCP influenza vaccination rates.	Ongoing Jan 2016
☒	☐	2. Establish an HAI surveillance prevention and control program i. Designate a State HAI Prevention Coordinator The HAI Program Coordinator provides leadership and program direction to maximize efforts for progress on the HHS HAI prevention targets and adherence to the statewide HAI plan.	Accomplished, 9/09
☒	☐	ii. Develop dedicated, trained HAI staff with at least one FTE (or contracted equivalent) to oversee HAI activities areas (Integration, Collaboration, and Capacity Building; Reporting, Detection, Response, and Surveillance; Prevention; Evaluation, Oversight, Communication, and Infection Control) The Massachusetts Healthcare-Associated Infection (HAI) Prevention and	Established 2008

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Control Program (HAI Program) was established in 2008. The HAI Program activities are directed by an integrated and coordinated Leadership Group that includes key components and senior directors of the Massachusetts Department of Public Health (MDPH), including the Bureau of Health Care Safety and Quality (the state regulatory and survey agent), and the Bureau of Infectious Disease and Laboratory Sciences (BIDLS). Senior leadership is accountable for providing strategic direction and oversight for all HAI monitoring and improvement strategies. This structure promotes interdisciplinary collaboration and accountability at all levels of the organization. The Leadership Group meets monthly. Agency Roles and Responsibilities: Bureau of Health Care Safety and Quality is mandated by state and federal statutes to license and certify health care facilities. The Bureau of Health Care Safety and Quality is responsible for ensuring compliance with state and federal regulations, associated guidelines and relevant best practices. Staff conduct unannounced on-site surveys to investigate complaints and ensure regulatory compliance. Bureau of Infectious Disease and Laboratory Sciences (BIDLS) provides HAI epidemiology services, surveillance and data analysis, investigates clusters and outbreaks, provides technical support for infection prevention recommendations, as well as policy implementation around HAIs, communicable diseases and emerging infections. State law provides MDPH with the legal and regulatory authority to monitor and investigate the causes of communicable and other infectious disease outbreaks (under 105 CMR 130) and positions MDPH to track trends as well as identify and investigate outbreaks, recognize emerging pathogens and unsafe medical practices, and ensure the implementation of	and ongoing

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		established prevention practices and standards.	
		<i>Other activities or descriptions:</i>	
☒	☐	3. Integrate laboratory activities with HAI surveillance, prevention, and control efforts. i. Improve laboratory capacity to confirm emerging resistance in HAI pathogens and perform typing where appropriate (e.g., outbreak investigation support, HL7 messaging of laboratory results) All hospital clinical laboratories are currently using electronic laboratory reporting, except for the two smallest hospitals in the state. The State Public Health Laboratory and three major commercial laboratories are using ELR or being brought on, and the local Veteran's Affairs health system is exploring ELR. ELR uses HL7 2.5.1 messaging and LOINC and SNOMED codes. MDPH is able to transform messages currently sent from hospitals (in HL7 2.3.1 or SMF formats) to HL7 2.5.1 format. Automated entry of laboratory information for reportable conditions via ELR facilitates accurate and timely detection of concerning trends and saves time associated with manual data entry or paper laboratory reporting. ELR is mandated by regulation (105 CMR 300.170: Laboratory Findings Indicative of Infectious Disease reportable Directly to the Department by Laboratories). MDPH continues to require reporting of all cases of invasive methicillin-resistant <i>Staphylococcus aureus</i> (MRSA). All laboratories must also report results indicating antimicrobial resistance in the following organisms	Established and ongoing

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		directly to the Department through secure electronic laboratory reporting mechanisms: Carbapenemase-producing and/or carbapenem-resistant <i>Enterobacteriaceae</i>, <i>Neisseria gonorrhoeae</i> resistant to fluoroquinolones or ceftriaxone, vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA), vancomycin-intermediate <i>Staphylococcus aureus</i> (VISA), invasive penicillin-resistant <i>Streptococcus pneumoniae</i>. If antimicrobial resistance of an unexplained or novel nature is identified in any infectious organism, the laboratory must contact the Department within five business days. All hospitals are now required to report their annual antibiograms to the Department in a standardized fashion. We are exploring means to allow for electronic laboratory reporting of antimicrobial susceptibility tests on all <i>Escherichia coli</i>, <i>Klebsiella</i> spp. and <i>Enterobacter</i> spp. performed in clinical laboratories. We currently collect susceptibility data on isolates from CLABSI and SSI's reported through NHSN. DPH also requires reporting of Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) Bacteremia LabID Events and <i>Clostridium difficile</i> Infection (CDI) LabID Events to NHSN. We are planning to require acute care hospitals (and potentially other healthcare facilities) to use the NHSN Antimicrobial Use and Resistance Module. Our State Public Health Laboratory has had extensive experience with pulse field gel electrophoresis and reports to PulseNet, and is gaining capacity and experience in other techniques of genomic characterization of organisms, including whole genome sequencing. The State Public Health Laboratory provides support to facilities and Department investigations by characterizing organisms for molecular epidemiology.	2017 and ongoing
		<i>Other activities or descriptions:</i>	

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	4. Improve coordination among government agencies or organizations that share responsibility for assuring or overseeing HAI surveillance, prevention, and control (e.g., State Survey agencies, Communicable Disease Control, state licensing boards) The necessary regulatory framework, core personnel resources and departmental leadership are in place. Designation of a dedicated HAI Coordinator has enhanced efforts. Designation of an Antibiotic Resistance Coordinator will enhance AR activities. Surveillance data, results of findings performed by MDPH state survey operations, consumer complaints and NHSN reported data are all utilized to identify areas for improvement.	Ongoing Complete, 2015 Ongoing
		<i>Other activities or descriptions:</i>	
☒	☐	5. Facilitate use of standards-based formats (e.g., Clinical Document Architecture, electronic messages) by healthcare facilities for purposes of electronic reporting of HAI data. Providing technical assistance or other incentives for implementations of standards-based reporting can help develop capacity for HAI surveillance and other types of public health surveillance, such as for conditions deemed reportable to state and local health agencies using electronic laboratory reporting (ELR). Facilitating use of standards-based solutions for external reporting also can strengthen relationships between healthcare facilities and regional nodes of healthcare information, such as Regional Health Information Organizations. (RHIOs) and Health Information Exchanges (HIEs). These relationships, in turn, can yield broader benefits for public health by consolidating electronic reporting through regional nodes.	

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Health Information Reporting Portal: laboratory and electronic health record data in Massachusetts – The Health Information Reporting Portal is what the MDPH Bureau of Infection Disease and Laboratory Sciences (BIDLS) uses to receive all electronic data feeds for MAVEN (Massachusetts Virtual Epidemiology Network—see also Table 2, Item 1ii); these include ELR, EHR (via ESPnet), and electronic case reporting forms. The ELR component, which is Meaningful Use stage 2 certified, allows hospitals and clinical laboratories to send data electronically on all reportable conditions to the MDPH BID. This includes laboratory results and clinical data held in EHRs. Laboratories utilize a web-based user mapping interface to translate local codes into BID selected LOINC and SNOMED equivalents. Institutions may securely transmit messages using the HL7 2.5.1 format or the 2.3.1 format that is transformed into HL7 2.5.1. Once the data have been translated, they are transmitted via HL7 2.5.1 messaging to MAVEN, and then automatically assigned to an appropriate disease event and surveillance case status, then triaged for notification and disease investigation. MAVEN is designated as a specialized registry for the Department. Case reports submitted via ESPnet will meet requirements for Meaningful Use specialized registries. All acute care hospitals have been trained, are enrolled and are submitting HAI data via NHSN. All Free-Standing Ambulatory Surgical Centers (ASC) have been trained, are enrolled and are submitting healthcare personnel influenza vaccination data via NHSN. We are currently in the process of working with the New England QIO to enroll	Established in 2006 and ongoing Established in 2006 and ongoing 2008 and ongoing 2015 and ongoing 2016

Table 1: Enhance HAI Program Infrastructure

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		LTCs in NHSN. The feasibility of a requirement for dialysis centers to report HAI data via NHSN is being explored by MDPH.	2016
		<i>Other activities or descriptions:</i> Massachusetts is the first state to require all licensed blood banks and transfusion services to report transfusion-related adverse events, using the CDC NHSN Hemovigilance Module.	June 1, 2014 and ongoing

Table 1: Enhance HAI Program Infrastructure

2. Surveillance, Detection, Reporting, and Response

Timely and accurate monitoring remains necessary to gauge progress towards HAI elimination. Public health surveillance has been defined as the ongoing, systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of public health practice, and timely dissemination to those responsible for prevention and control.¹ Increased participation in systems such as the National Healthcare Safety Network (NHSN) has been demonstrated to promote HAI reduction. This, combined with improvements to simplify and enhance data collection, and improve dissemination of results to healthcare providers and the public are essential steps toward increasing HAI prevention capacity.

The HHS Action Plan identifies targets and metrics for five categories of HAIs and identified Ventilator-associated Pneumonia as an HAI under development for metrics and targets (Appendix 1):

- Central Line-associated Blood Stream Infections (CLABSI)
- *Clostridium difficile* Infections (CDI)
- Catheter-associated Urinary Tract Infections (CAUTI)
- Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections
- Surgical Site Infections (SSI)
- Ventilator-associated Pneumonia (VAP)

State capacity for investigating and responding to outbreaks and emerging infections among patients and healthcare providers is central to HAI prevention. Investigation of outbreaks helps identify preventable causes of infections including issues with the improper use or handling of medical devices; contamination of medical products; and unsafe clinical practices.

¹ Thacker SB, Berkelman RL. Public health surveillance in the United States. *Epidemiol Rev* 1988;10:164-90.

Table 2: State planning for surveillance, detection, reporting, and response for HAIs

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Improve HAI outbreak detection and investigation i. Work with partners including CSTE, CDC, state legislatures, and providers across the healthcare continuum to improve outbreak reporting to state health departments Experience with review and oversight will guide ongoing improvement of processes and responses to serious breaches in infection control, suspect cases and clusters, and outbreaks. The formalization of infection prevention review and oversight will enhance the already well-established collaboration of the Bureau of Health Care Safety and Quality and the Bureau of Infectious Disease and Laboratory Sciences in occurrence and outbreak investigation and follow-up.	Established and ongoing
☒	☐	ii. Establish protocols and provide training for health department staff to investigate outbreaks, clusters, or unusual cases of HAIs. We are at the initial stages of implementing MAVEN (Massachusetts Virtual Epidemiology Network) for provider reporting. The vision is that infection preventionists will have access to this web-based surveillance and case management system, and will be able to enter reportable infectious disease information, update records and communicate securely with MDPH. The communication functionality can offer a secure sharing of clinical and other information in a variety of situations, such as in the case of patients under investigation for Ebola virus disease, Middle East respiratory syndrome, etc., as well as in the case of facility based outbreaks using the outbreak module in	2016

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	MAVEN. MAVEN offers the opportunity for enhanced efficiency in a variety of situations, both routine and emergent. MAVEN utilizes role based access to ensure only those staff at state and local levels (and eventually designated facilities) with a programmatic need to know may view or update appropriate data. Data restrictions are configurable by specific disease, locale, individual variable, and staff function. We plan to begin with pilots of provider reporting involving several large hospitals and a subset of diseases in 2016-17. In addition, CDC's outbreak assessment tool for responding to reports of infection control breaches, clusters or suspected outbreaks will be implemented when it is available. . iii. Develop mechanisms to protect facility/provider/patient identity when investigating incidents and potential outbreaks during the initial evaluation phase, where possible, to promote reporting of outbreaks Maintaining the privacy of confidential data held at the Department of Public Health (MDPH) is critical to the fulfillment of core public health responsibilities. Confidential information can only be shared in limited circumstances. Massachusetts Virtual Epidemiologic Network (MAVEN) is a web-based disease surveillance and case management system that enables MDPH and local health to capture and transfer appropriate public health, laboratory, and clinical data efficiently and securely over the Internet in real-time. Users of the system are required to agree to the security and confidentiality rules of	2016 Established and ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	the MDPH. MDPH will continue to evaluate the security of surveillance systems to ensure individual privacy and confidentiality. iv. Improve overall use of surveillance data to identify and prevent HAI outbreaks or transmission in HC settings (e.g., hepatitis B, hepatitis C, multi-drug resistant organisms (MDRO), and other reportable HAIs) Data obtained from BHCSQ Healthcare Facility Reporting System (HCFRS) as well as information obtained during the investigation of complaints and on-site surveys is also used to identify, monitor and investigate clusters and outbreaks. ELR data submitted by all acute care hospital labs is also used to help detect clusters and outbreaks.	Established and ongoing
		<i>Other activities or descriptions:</i> MDPH collaborates with local boards of health and providers in various healthcare settings (acute, long term care, ambulatory and outpatient care) to provide disease specific infection control guidance, treatment protocols, and need for patient notification for reported clusters, outbreaks, or unusual cases of infection.	
☒	☐	2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues. All clinical laboratories reporting electronically by using HL-7 messaging and LOINC and SNOMED codes. Laboratory response network (LRN) protocols in place.	2010 and ongoing
		<i>Other activities or descriptions:</i>	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	3. Improve communication of HAI outbreaks and infection control breaches i. Develop standard reporting criteria including, number, size, and type of HAI outbreak for health departments and CDC The target date for implementation is dependent on the establishment of national criteria. Enhanced MDPH infrastructure supported by the ELC 2015 Ebola funding has provided nurse consultants who will assist in the identification and mitigation of gaps in infection control practices and outbreak reporting.	
☒	☐	ii. Establish mechanisms or protocols for exchanging information about outbreaks or breaches among state and local governmental partners (e.g., State Survey agencies, Communicable Disease Control, state licensing boards) Surveillance data, information reported to the MDPH Healthcare Facility Reporting System (HCFRS), as well as lapses in infection control identified by the MDPH survey process are routinely communicated. There has also been longstanding collaboration between the Bureau of Infectious Disease and Laboratory Sciences, the Bureau of Health Care Safety and Quality, and the Sharps Injury Surveillance and Prevention Program. State public health officials rely on local boards of health, healthcare providers, laboratories and other public health personnel to report the occurrence of notifiable diseases as required by law	Established and ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		(Massachusetts General Laws, Chapter 111, sections 3, 6, 7, 109, 110, 111 and 112 and Chapter 111D, Section 6. These laws are implemented by regulation under Chapter 105, Code of Massachusetts Regulations (CMR), Section 300.000: Reportable Diseases, Surveillance, and Isolation & Quarantine Requirements.) 105 CMR 300.134 requires the reporting of outbreaks or clusters- the occurrence in a community, facility, workplace or region of cases of an illness clearly in excess of the number of cases usually expected. The number of cases indicating an outbreak or cluster will vary according to the infectious agent or the site conditions/hazards, size and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence. Outbreaks or clusters are therefore identified by significant increases in the usual frequency of the disease in the same area, among the specified population, at the same season of the year. Serious breaches in infection control identified during state licensing and complaint surveys and the infections of concern identified through surveillance data and provider reports are routinely shared with the HAI Coordinator. In all these circumstances, joint action of the Bureau of Health Care Safety and Quality and the Bureau of Infectious Disease and Laboratory Sciences is taken to both investigate outbreaks and evaluate facility practices and breaches in evidence based infection control.	
		<i>Other activities or descriptions:</i>	
		4. Identify at least 2 priority prevention targets for	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	surveillance in support of the HHS HAI Action Plan i. Central Line-associated Bloodstream Infections (CLABSI) All acute care hospital adult, pediatric and neonatal ICUSs are required to report CLASBI to NHSN.	Ongoing since 2008
☒	☐	ii. <i>Clostridium difficile</i> Infections (CDI) All acute care hospitals are required to report facility wide laboratory ID events to NHSN.	Ongoing since 2014
☒	☐	iii. Catheter-associated Urinary Tract Infections (CAUTI) All acute care hospital ICUs are required to report CAUTI to NHSN. We plan to expand this requirement to all adult and pediatric medical, surgical and medical/surgical wards.	Ongoing since 2014 2016
☒	☐	iv. Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) Infections Surveillance for invasive disease in place since 1999 will be enhanced by full ELR. All acute care hospitals are required to report facility wide laboratory ID events to NHSN.	Ongoing since 2014
☒	☐	v. Surgical Site Infections (SSI) All acute care hospitals are required to report to NHSN the	Ongoing since 2008 for CABG, hip

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	following SSIs: CABG, hip arthroplasty, knee arthroplasty, abdominal hysterectomy, vaginal hysterectomy, and colon procedures. vi. Ventilator-associated Pneumonia (VAP) Preventive best practices have been identified. Further direction on metrics and targets will be guided by CDC and the TAG.	arthroplasty, knee arthroplasty, abdominal hysterectomy, vaginal hysterectomy, and since 2014 for colon procedures.
		<i>Other activities or descriptions:</i> Massachusetts produces annually a statewide hospital summary of HAI rates. The most recent report can be found at this link: http://www.mass.gov/eohhs/gov/departments/dph/programs/hcq/healthcare-quality/health-care-facilities/hospitals/healthcare-assoc-infections/healthcare-associated-infections-reports.html MDPH works closely with key collaborators including the Massachusetts Health and Hospital Association and Healthcentrics, the New England Quality Improvement Organization, to promote alignment of goals and avoid duplication of efforts.	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	5. Adopt national standards for data and technology to track HAIs (e.g., NHSN). i. Develop metrics to measure progress towards national goals (align with targeted state goals). (See Appendix 1). MDPH’s ultimate goal is to eliminate all preventable HAIs. Metrics are based on infection rates and SIRs established using the most recent available NHSN baselines, risk adjusted where appropriate.	Ongoing
☒	☐	ii. Establish baseline measurements for prevention targets. The following targets have been established, with targets based on national reduction goals: Reduce the CLABSI SIR by at least 50% from baseline or to zero in ICU and other locations MDPH provides analysis of CLABSI data that includes comparison to both state and national baseline data. Reduce the CAUTI SIR by at least 25% from baseline or to zero in ICU and other locations Reduce the admission and readmission SSI SIR by at least 25% from baseline or to zero Reduce the facility-wide healthcare facility-onset MRSA bacteremia LabID event SIR by at least 25% from baseline or to zero Reduce the facility-wide healthcare facility-onset C. difficile LabID event SIR by at least 30% from baseline or to zero	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		MDPH will select further targets in conjunction with the TAG, and as CDC and the US Department of Health and Human Services identify new and enhanced prevention goals.	
		<i>Other activities or descriptions:</i> Conduct additional analyses of Hospital Discharge Data Set (HDDS).	
☒	☐	6. Develop state surveillance training competencies i. Conduct local training for appropriate use of surveillance systems (e.g., NHSN) including facility and group enrollment, data collection, management, and analysis Ongoing technical assistance is provided by epidemiologists and the HAI Coordinator for NHSN facility users. MDPH in collaboration with Healthcentrics, the QIO, is working to enroll up to 80 nursing homes in NHSN as a demonstration project.	Ongoing January 2016
		<i>Other activities or descriptions:</i>	
☒	☐	7. Develop tailored reports of data analyses for state or region prepared by state personnel HAI reports are intended to provide meaningful, relevant and easily understandable information for a wide variety of stakeholders and audiences. Consideration of the needs, background and expectations of the reader is critical to communicating results and will increase the likelihood that the reports will have an impact. Updates on HAIs in Massachusetts acute care hospitals that include hospital specific data and SIRs, are prepared by MDPH and made available to the public.	Initiated 2009 and ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		The annual report includes state summary measures for central line associated bloodstream infections (CLABSI) and specific surgical site infections (SSI), and healthcare personnel influenza vaccination data. The annual report also includes a hospital specific summary for each hospital. CDI and MRSA facility wide laboratory events and CAUTI in all ICUs will be included in future annual data updates.	2016
		<i>Other activities or descriptions:</i> The standardized infection ratio (SIR) is a summary measure used to track HAIs over time. It compares actual HAI rates in a facility or state with baseline rates derived from aggregate data from NHSN. The CDC adjusts the SIR for risk factors that are most associated with differences in infection rates. In other words, the SIR takes into account that different healthcare facilities treat patients with differences in disease type and severity. NHSN data are shared monthly with the Massachusetts Hospital Association (MHA) to monitor prevention activities and evaluate trends. MHA makes the data available on their Patient Care Link http://www.patientcarelink.org/Healthcare-Provider-Data/Hospital-Data/Statewide-Aggregate-Performance-Measures.aspx NHSN data was shared monthly with AHA/HRET Hospital Engagement Network (HEN) to monitor effectiveness of prevention initiatives. NHSN data are shared quarterly with NeoQIC, the Neonatal Quality Improvement Collaborative of Massachusetts. All Massachusetts NICUs participate (n=10) in the collaborative.	Ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒ ☒ ☒ ☒ ☒ ☒	☐ ☐ ☐ ☐ ☐ ☐	8. Validate data entered into HAI surveillance (e.g., through healthcare records review, parallel database comparison) to measure accuracy and reliability of HAI data collection. i. Develop a validation plan ii. Pilot test validation methods in a sample of healthcare facilities iii. Modify validation plan and methods in accordance with findings from pilot project iv. Implement validation plan and methods in all healthcare facilities participating in HAI surveillance v. Analyze and report validation finding vi. Use validation findings to provide operational guidance for healthcare facilities that targets any data shortcomings detected External validation is essential to ensure high quality surveillance data. MDPH external validation of data is contingent on support received from the Centers for Disease Control and Prevention. Measures selected for external validation have included central line associated blood stream infections and surgical site infections related to abdominal hysterectomy procedures. MDPH is currently conducting an external validation of SSI related to vaginal hysterectomy procedures. MDPH utilizes the NHSN External Validation Guidance and Toolkits to identify hospitals. Selected hospitals are identified using a targeted selection algorithm developed by the CDC that targets facilities with high volume of exposure to HAI risk. A team of MDPH epidemiologists conduct the on-site validation visits to review medical records.	2015-2016

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Findings from hospital specific validation visits are summarized in a report and shared with hospital infection preventionists following the site visit. Information learned through the process has been shared with CDC.	
		<i>Other activities or descriptions:</i> MDPH has established a quality assurance system to assess the completeness and accuracy of data reported to NHSN. The data cleaning reports are distributed quarterly to hospital infection preventionists to reconcile NHSN data. The quarterly reports align with CDC's hospital internal validation guidance. The statistical analysis software (SAS) program and the standard operating procedure developed by MDPH epidemiologists have been made available to other states to support their HAI Programs.	2016
☒	☐	9. Develop preparedness plans for improved response to HAI i. Define processes and tiered response criteria to handle increased reports of serious infection control breaches (e.g., syringe reuse), suspect cases/clusters, and outbreaks Massachusetts demonstrates a well-established approach for public health preparedness. The Reportable Diseases, Surveillance, and Isolation and Quarantine Regulations (105 CMR 300.134) require licensed hospitals to report illness believed to be part of an outbreak or cluster. The hospital licensure regulations governing the reporting of serious incidents and accidents (105 CMR 130.331) require hospitals to report incidents that seriously affect the health and safety of patients, including "reportable infectious disease outbreaks".	Established and ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		The MDPH's Epidemiology Program within the Bureau of Infectious Disease and Laboratory Sciences develops data collection mechanisms for new and emerging infections such as MERS and Ebola. Investigations are triggered in the following ways: • Surveillance data is monitored by state epidemiologists to detect possible clusters and outbreaks. • Hospitals monitor data and consult with and report data to MDPH. • The Bureau of Health Care Safety and Quality routinely communicates any suspected clusters or outbreaks identified through consumer complaints and on-site survey activities. MAVEN provides expedited data collection, communications and work flows as part of an Outbreak Module which can be readily configured for outbreaks. State capacity to respond to serious breaches or suspected clusters or outbreaks has been enhanced by the addition of contracted staff supported by the Ebola supplement. Activities conducted under the Ebola supplement provided the state substantial opportunities to identify gaps in infection prevention and control practice in healthcare facilities. CDC's patient notification tool kit for responding to reports of infection control breaches, clusters or suspected outbreaks has been	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		utilized when applicable. CDC's outbreak assessment tool for responding to reports of infection control breaches, clusters or suspected outbreaks will be implemented when it is available.	2016
		<i>Other activities or descriptions:</i>	
☒	☐	10. Collaborate with professional licensing organizations to identify and investigate complaints related to provider infection control practice in non-hospital settings and set standards for continuing education and training The Division of Health Professions Licensure within the Massachusetts Department of Public Health is comprised of eight boards of registration: Dentistry, Genetic Counselors, Nursing, Nursing Home Administrators, Perfusionists, Pharmacy, Physician Assistants and Respiratory Care. They establish rules and regulations to ensure the integrity and competence of licensees. The Board of Registration in Medicine licenses and regulates physicians. MDPH collaborates with professional licensing organizations to identify and investigate HAI-related complaints in physician offices, ambulatory surgical centers and free-standing dialysis centers.	Established and ongoing
		<i>Other activities or descriptions:</i>	
☒	☐	11. Adopt integration and interoperability standards for HAI information systems and data sources i. Improve overall use of surveillance data to identify and prevent HAI outbreaks or transmission in HC settings (e.g., hepatitis B,	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	hepatitis C, multi-drug resistant organisms (MDRO), and other reportable HAIs) across the spectrum of inpatient and outpatient healthcare settings The infrastructure that supports infectious disease surveillance in Massachusetts is fully interoperable and compliant with all state and national standards for technology and security. MAVEN fully interfaces with MDPH's Health Information Reporting Portal and can exchange information with Centers for Disease Control and Prevention (CDC) via standards-based electronic messaging. Acute HBV and HCV infection cases are automatically placed in workflows for epidemiologists to investigate and determine exposure status. A new MDRO event will be used to capture individual cases of CRE and other drug-resistant organisms. Clusters of infections of HAI pathogens, including HBV, HCV and MDROs are managed via an outbreak module in MAVEN. ii. Promote definitional alignment and data element standardization needed to link HAI data across the nation. MDPH is committed to the promotion of electronic laboratory reporting (ELR) by healthcare facilities. ELR has demonstrated the potential to reduce the reporting burden and increase efficiency and reliability of the data. Currently, all hospital clinical laboratories except for the two smallest hospitals and half of the commercial laboratories in Massachusetts are submitting data through ELR. Remaining laboratories are in process of being connected. NHSN is the largest HAI reporting system in the United States. NHSN provides standard methods and definitions, online training modules, user support, and facility comparison tools. U.S. hospitals	Ongoing 2011 and ongoing Established and ongoing

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		and dialysis facilities are able to successfully report to NHSN, making it an important tool for national HAI tracking. All Massachusetts acute care hospitals report HAIs through NHSN.	
		<i>Other activities or descriptions:</i>	
☒	☐	12. Enhance electronic reporting and information technology for healthcare facilities to reduce reporting burden and increase timeliness, efficiency, comprehensiveness, and reliability of the data i. Report HAI data to the public NHSN data is reported by all acute care hospitals and to CMS. Reports on HAI rates in Massachusetts hospitals are available to the public on the MDPH website and the Medicare Hospital Compare website. See the most recent report at this link: http://www.mass.gov/eohhs/gov/departments/dph/programs/hcq/healthcare-quality/health-care-facilities/hospitals/healthcare-assoc-infections/healthcare-associated-infections-reports.html	Established and ongoing
		<i>Other activities or descriptions:</i>	
☒	☐	13. Make available risk-adjusted HAI data that enable state agencies to make comparisons between hospitals. The basis for comparison of data includes national and state benchmarks. Massachusetts HAI reports include standardized infection ratios (SIR). “TAP Reports” were implemented in NHSN in alignment with CDC’s Targeted Assessment for Prevention (TAP) strategy. The TAP strategy allows for the ranking of facilities (or locations) in order to	Established and ongoing 2016

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		identify and target those areas with the greatest need for improvement. TAP strategy uses a metric called the cumulative attributable difference (CAD) to quantify and rank the excess number of infections in reference to a comparison goal based on a target SIR (e.g., 1, HHS HAI Action Plan goal, state-specific goal). The CAD subtracts the number of predicted infections (given the target SIR) from the number of observed infections. Lower CADs are better. More information about the TAP strategy can be found here: http://www.cdc.gov/hai/prevent/tap.html The TAP strategy allows for the ranking of facilities (or locations) in order to identify and target those areas with the greatest need for improvement. MDPH will disseminate quarterly aggregate and hospital specific TAP reports to hospital infection preventionists. Findings from TAP reports will be used as tools for identification and evaluation of infection prevention interventions. NHSN data are shared monthly with the Massachusetts Hospital Association (MHA) to monitor prevention activities and evaluate trends. MHA makes the data available on their Patient Care Link http://www.patientcarelink.org/Healthcare-Provider-Data/Hospital-Data/Statewide-Aggregate-Performance-Measures.aspx NHSN data was shared monthly with AHA/HRET Hospital Engagement Network (HEN) to monitor effectiveness of prevention initiatives.	

Table 2: Surveillance, Detection, Reporting, and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		NHSN data are shared quarterly with NeoQIC, the Neonatal Quality Improvement Collaborative of Massachusetts. All Massachusetts NICUs participate (n=10) in the collaborative.	
		<i>Other activities or descriptions:</i>	

Table 2: Surveillance, Detection, Reporting, and Response

3. Prevention

State implementation of HHS Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations is a critical step toward the elimination of HAIs. CDC and HICPAC have developed evidence-based HAI prevention guidelines cited in the HHS Action Plan for implementation. These guidelines are translated into practice and implemented by multiple groups in hospital settings for the prevention of HAIs. CDC guidelines have also served as the basis for the Centers for Medicare and Medicaid Services (CMS) Surgical Care Improvement Project. These evidence-based recommendations have also been incorporated into Joint Commission standards for accreditation of U.S. hospitals and have been endorsed by the National Quality Forum. Please select areas for development or enhancement of state HAI prevention efforts.

Table 3: State planning for HAI prevention activities

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Implement HICPAC recommendations i. Develop strategies for implementation of HICPAC recommendations for at least 2 prevention targets specified by the state multidisciplinary group. Current targets and metrics (for CLABSI, SSIs, VAP, MRSA and C-diff) are consistent with those identified by national organizations including HICPAC, CDC, the National Quality Forum (NQF), the Society for Healthcare Epidemiology of America (SHEA), the Association of Professionals in Infection Control and Epidemiology (APIC) and the Infectious Diseases Society of America (IDSA).	Established 2008 and ongoing
		<i>Other activities or descriptions:</i>	
☒	☐	2. Establish prevention working group under the state HAI advisory council to coordinate state HAI collaboratives i. Assemble expertise to consult, advise, and coach inpatient healthcare facilities involved in HAI prevention collaboratives Areas for focused collaboration are guided by the Technical Advisory Group (TAG) and coordinated by the state HAI program in conjunction with additional stakeholders including the Massachusetts Hospital Association and Healthcentrics, the QIO. Together we work with healthcare providers to promote collaboration, avoid duplication and facilitate the sharing of tools, resources and strategies to promote improvement.	Established and ongoing
		<i>Other activities</i> With funding from CDC, MDPH has developed an infection control training program for outpatient dialysis settings.	2015-2017

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		MDPH will continue to explore the potential for collaboration with academic institutions and additional partners to promote improvement. Working with professional organizations and academic partners, MDPH will continue to offer or co-sponsor conferences and other opportunities in infection prevention education. MDPH program staff are available to provide formal presentations and updates at local and regional conferences and meetings upon request. Program staff will continue to participate in NHSN trainings, Council of State and Territorial Epidemiologists (CSTE) calls, and CDC collaborative meetings.	Ongoing
		3. Establish HAI collaboratives with at least 10 hospitals (this may require a multi-state or regional collaborative in low population density regions) MDPH is collaborating with the Massachusetts Hospital Association and the QIO on a CDC/HRET initiative to improve implementation of infection prevention and control efforts in acute care hospitals. The initial measure for focused intervention is CDI. The Massachusetts Neonatal Quality Improvement Collaborative (MassNeoQIC) represents all 10 level 3 neonatal intensive care units (NICUs) in Massachusetts. MDPH routinely provides HAI data to MassNeoQIC to utilize for quality improvement initiatives. MDPH recognizes NeoQIC as an additional source of consultation related to infection prevention issues in neonatal intensive care.	2016-2018

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	i. Identify staff trained in project coordination, infection control, and collaborative coordination MDPH is committed to collaborating with internal and external partners to support training to increase knowledge and skills on HAI surveillance and prevention.	Ongoing
☒	☐	ii. Develop a communication strategy to facilitate peer-to-peer learning and sharing of best practices MDPH will continue to collaborate with Healthcentrics the New England Quality Improvement Organization (QIO), during the ^{11h} Scope of Work. Prevention strategies and data collection processes developed during this project have the potential to be used to inform and guide future state initiatives.	Established and ongoing
☒	☐	iii. Establish and adhere to feedback from standardized outcome data to track progress MDPH epidemiologists have developed a plan and process to provide HAI data to the Massachusetts Hospital Association to aid in monitoring progress on reducing HAIs and evaluating prevention initiatives. MDPH provides HAI outcome data to MHA for these purposes.	Established and ongoing
		<i>Other activities or descriptions:</i>	
☒	☐	4. Develop state HAI prevention training competencies i. Consider establishing requirements for education and training of healthcare professionals in HAI prevention (e.g., certification	

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		requirements, public education campaigns, and targeted provider education) or work with healthcare partners to establish best practices for training and certification MDPH is committed to collaborating with internal and external partners to support training to increase knowledge and skills on HAI surveillance and prevention. Core competencies will be identified and implementation strategies developed. MDPH is investigating current infection prevention and control education and training standards or requirements in MA healthcare facilities; collecting information from APIC, HICPAC, SHEA and other organizations on best practices and standards for education and training; and collecting information from several other states (e.g., NY, CA, TN, NC, SC), that already have state regulations to require provision of education and training in healthcare facilities to inform the MA process. To develop continuing education and standards for competence and practice for all care settings, MDPH will engage the TAG in further defining best practices for training and certification of professionals in HAI prevention. MDPH will also consult with internal and external expertise in regard to establishing requirements for education, training and certification of healthcare professionals in HAI prevention.	2016
		<i>Other activities or descriptions:</i>	
		5. Implement strategies for compliance to promote adherence to HICPAC recommendations	

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	i. Consider developing statutory or regulatory standards for healthcare infection control and prevention or work with healthcare partners to establish best practices to ensure adherence MDPH is investigating current infection prevention and control education and training standards or requirements in MA healthcare facilities; collecting information from APIC, HICPAC, SHEA and other organizations on best practices and standards for education and training; and collecting information from several others states (e.g., NY, CA, TN, NC, SC), that already have state regulations to require provision of education and training in healthcare facilities to inform the MA process. Using the information collected, MDPH will explore the feasibility of promulgating state regulations to require provision of infection prevention and control education and training as a condition of professional licensure. Exploration will include seeking the input of the TAG and interviewing representatives of the MA Board of Registration in Medicine and MDPH Division of Health Professions Licensure. Details of proposed/considered regulations will be determined through the established regulatory development and promulgation processes.	2016
☒	☐	ii. Coordinate/liaise with regulation and oversight activities such as inpatient or outpatient facility licensing/accrediting bodies and professional licensing organizations to prevent HAIs Licensing bodies and organizations are all housed within MDPH and staff from these agencies participate as members of the HAI Leadership Group.	Ongoing
☒	☐	iii. Improve regulatory oversight of hospitals, enhance surveyor	

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		training and tools, and add sources and uses of infection control data Massachusetts licensed healthcare facilities are held accountable under regulations of the MDPH Bureau of Health Care Safety and Quality for full compliance with: • Implementation of best practices • The Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines • The requirements of CMS • Maintenance of participation in NHSN and timely and accurate completion of data collection and entry • Full and complete reporting of mandated reporting measures Oversight includes: Incorporation of review for compliance with HAI prevention and reporting requirements in routine and other surveys MDPH surveyors determine compliance with the infection control Conditions for Coverage. Items are assessed primarily by surveyor observation, with interviews used to provide additional confirming evidence of observations. Healthcare facilities are required to comply with nationally	Established and ongoing

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	recognized and accepted standards of practice. Lapses in infection control are documented and facilities are required to submit corrective action plans indicating the process and timeline to complete the required improvements. iv. Consider expanding regulation and oversight activities to currently unregulated settings where healthcare is delivered and work with healthcare partners to establish best practices to ensure adherence MDPH will collaborate with the Executive Office of Elder Affairs to discuss issues related to infection control in assisted living facilities, and will provide technical consultation as requested.	2016
		<i>Other activities or descriptions:</i> The MA State Health Improvement Plan, or SHIP, is an action-oriented strategic plan that outlines the key health and health systems priority areas for the state, and how these priority areas will be addressed to ultimately improve the health of all people in the Commonwealth. The MA SHIP was created through a statewide, collaborative planning process that engages partners and organizations to develop, support, and implement the plan. This development process enables loosely-networked system partners to coordinate for more efficient, targeted and integrated health improvement efforts. The SHIP serves as a vision for health and a framework for organizations to use in leveraging resources, engaging partners, and identifying their own priorities and strategies for collective action towards improving community health and achieving health equity. HAI related objectives include: • Maintain and enhance the Commonwealth's public reporting	

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		infrastructure for Healthcare Associated Infections • Enhance public education and quality of evidence-based infection prevention and prudent and effective use of antimicrobials in all health care settings • Establish collaborative prevention programs • Reduce standard infection ratios (SIR) to 1.00 or below for CLABSI's, SSI's and CAUTI's, in acute care hospitals through application of evidence-based interventions. http://www.mass.gov/eohhs/docs/dph/health-planning/accreditation/state-health-improvement-plan.pdf	
☐	☒	6. Enhance prevention infrastructure by increasing joint collaboratives with at least 20 hospitals (i.e. this may require a multi-state or regional collaborative in low population density regions) Massachusetts has well established effective prevention collaboratives working strategically at the state level with national partners to support clinicians and health care systems in the prevention of HAI. Interstate collaboration and coordination of prevention efforts provides an opportunity to strengthen partnerships, share resources and leverage learning to accelerate improvement.	2016-2017
		<i>Other activities or descriptions:</i> 2010-2012: CDI collaborative consisting of 27 acute care hospitals resulted in a 25% decrease in hospital-acquired CDI.	
		7. Establish collaborative(s) to prevent HAIs in nonhospital settings (e.g., long term care, dialysis)	

Table 3: Prevention

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	With support from CDC and IPRO, the ESRD QIO, MDPH has developed a series of trainings for dialysis nurses. The primary goal of the trainings is to prevent infections in hemodialysis settings utilizing CDCs Core Interventions. An innovative teaching modality that has been utilized in the trainings is the use of simulation exercises to enhance learning. MDPH is collaborating with the Healthcentrics on the CMS QIN-QIO CDI reporting and reduction project. Program objectives include enrolling Massachusetts nursing homes in the CDC's National Healthcare Safety Network, providing tools and educational resources to promote improvement and using data to drive change.	2014 and ongoing 2016 and ongoing
		<i>Other activities or descriptions:</i> Selected Past Initiatives (2011-2102): Improving Evaluation of Urinary Tract Infections in the Elderly: Collaborative on Antibiotic Stewardship for Seniors in Long Term Care The focus of the collaborative was to reduce the inappropriate use of antibiotics. Faculty coached clinical staff in long term care facilities and hospital emergency departments to: • Improve evaluation and treatment of urinary tract infection. • Decrease treatment for asymptomatic bacteriuria. • Use clinical quality improvement tools for decision support. • Communicate with patients and their loved ones for safer care. http://www.macoalition.org/evaluation-and-treatment-uti-in-elderly.shtml#webinars MDPH staff will continue to promote participation by free standing dialysis center staff in the CDC Hemodialysis Collaborative.	

Table 3: Prevention

4. Evaluation and Communication

Program evaluation is an essential organizational practice in public health. Continuous evaluation and communication of findings integrates science as a basis for decision-making and action for the prevention of HAIs. Evaluation and communication allows for learning and ongoing improvement. Routine, practical evaluations can inform strategies for the prevention and control of HAIs. Please select areas for development or enhancement of state HAI prevention efforts.

Table 4: State HAI communication and evaluation planning

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Conduct needs assessment and/or evaluation of the state HAI program to learn how to increase impact i. Establish evaluation activity to measure progress toward targets and A systematic ongoing process of program evaluation is critical to ensuring improvement. Evaluation promotes accountability, provides the basis to assess effectiveness and helps guide decisions on how resources and efforts should be allocated. Evaluation of the state HAI program led to a decision to expand HAI measures for reporting in accordance with CMS requirements for hospitals. The expanded list of HAI measures reported on in MA now includes C-diff, MRSA and SSI for colon surgeries. MDPH will conduct a survey to accurately depict the amount of time spent on data collection and entry into NHSN; understand which, if any, facilities in Massachusetts are currently using NHSN AUR module; assess the capacity for electronic upload to the AUR module and the Biovigilance Component and document the type(s) of EHR systems that are currently in use within Massachusetts facilities. Survey results will be used to guide program advancement. MDPH will continue to work with state and federal partners to identify emerging issues, prevention	June 2016 Ongoing

Table 5: Infection Control and Response

☒	☐	activities and areas for additional research. ii. Establish systems for refining approaches based on data gathered MDPH uses reported data, results of additional surveillance activities, and outcomes from collaborative prevention initiatives to select priorities for the state HAI program.	Ongoing
		<i>Other activities or descriptions (not required):</i>	
☒	☐	2. Develop and implement a communication plan about the state's HAI program and about progress to meet public and private stakeholders needs i. Disseminate state priorities for HAI prevention to healthcare organizations, professional provider organizations, governmental agencies, non-profit public health organizations, and the public Consistent with the principles of transparency and public engagement, the HAI Program's ultimate goal for surveillance and reporting is to have full public access to data on outcomes and process measures that are required by the MDPH in a format determined by the Department with the guidance from the TAG. The Massachusetts HAI Program issues reports of required outcome and process measures, by facility and in aggregate, annually. Progress toward state HAI goals is highlighted. Assuring transparency, all reports of mandated measures are posted on the MDPH website and links to the reports are publically available.	Established and ongoing

Table 5: Infection Control and Response

		MDPH provides quarterly feedback to hospitals on issues related to data quality and completeness of reporting. MDPH provides quarterly NHSN “Targeted Assessment for Prevention” (TAP) Reports for acute care hospitals. The TAP Reports allow for the ranking of facilities (or locations) in order to identify and target those areas with the greatest need for improvement MDPH provides timely data to guide collaborative prevention efforts: Periodic presentations are provided for the Massachusetts Public Health Council, which is with the Commissioner chairing, the legal entity of the Department. The Public Health Council has the authority to approve regulations. Promulgation of regulations and regulatory amendments are subject to public comment and review, in accordance with state law and policy, and with approval of the Public Health Council. The Massachusetts State HAI Plan is posted on the MDPH and CDC websites.	Ongoing 2016 and ongoing Ongoing since 2010
		<i>Other activities or descriptions:</i>	
		3. Provide consumers access to useful healthcare quality measures	

Table 5: Infection Control and Response

☒	☐	i. Disseminate HAI data to the public MDPH provides the following data annually on its website, as both a statewide summary and an update providing hospital-specific information: • SSI resulting after primary hip or knee arthroplasty, by hospital • SSI resulting from abdominal and vaginal hysterectomy, by hospital • CLABSI in adult, pediatric and neonatal ICU patients, by hospital • SSI resulting from CABG, by hospital • Hospital -specific Healthcare personnel influenza vaccination data MDPH will include SSI from colon procedures. Methicillin Resistant Staphylococcus aureus (MRSA) Bacteremia LabID Events and Clostridium difficile Infection (CDI) LabID Events. MDPH continues to evaluate current methods of reporting HAI information to the public, and strives to develop improved methods of displaying HAI data.	Ongoing since 2010 June 2016 and ongoing
		<i>Other activities or descriptions:</i> MDPH encourages acute care hospital CEOs to share the HAI updates with Boards of Trustees, Patient and Family Advisory Councils, and with their professional staff/healthcare providers.	

Table 5: Infection Control and Response

☒	☐	4. Guide patient safety initiatives i. Identify priorities and provide input to partners to help guide patient safety initiatives and research aimed at reducing HAIs MDPH routinely provides data to support patient safety activities conducted by the Massachusetts Hospital Association and the Betsy Lehman Center for Patient Safety and Medical Error Reduction. The Massachusetts Neonatal Quality Improvement Collaborative (MassNeoQIC) represents all 10 level 3 neonatal intensive care units (NICUs) in Massachusetts. MDPH routinely provides HAI data to MassNeoQIC to utilize for quality improvement initiatives.	Established and ongoing
		<i>Other activities or descriptions:</i>	

Table 5: Infection Control and Response

Healthcare Infection Control and Response (Ebola-associated activities)

The techniques and practice on which infection control protocols are based form the backbone of infectious disease containment for pathogens that are otherwise amplified and accelerated in healthcare settings. Investments in a more robust infection control infrastructure will prevent many HAIs transmitted to, and among, patients and health care workers.

Table 5: Infection Control Assessment and Response

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Create an inventory of all healthcare settings in state. List must include at least one infection control point of contact at the facility The inventory of healthcare settings will be accomplished by administering a survey to approximately 757 healthcare facilities in Massachusetts. Healthcare facilities to be surveyed will include non-acute and acute care hospitals, ambulatory surgical centers, outpatient centers including community health centers licensed by MDPH, long term care facilities and hemodialysis centers. The survey will ask facilities to describe personnel involved in infection control implementation, their infection control points of contacts, general infection control program activities, whether or not their healthcare facility participates in any accreditation programs, and their policies and procedures for reporting communicable and infectious diseases. The inventory of healthcare facilities was updated in 2017.	Jan- May 2016
☒	☐	2. Identify current regulatory/licensing oversight authorities for each healthcare facility and explore ways to expand oversight In Massachusetts, the Division of Health Care Facility Licensure and Certification is the state agency responsible for the licensure of health care facilities under state law, and the certification of health care facilities and agencies participating in the Medicare and Medicaid programs. To identify other	Complete October 2017 Jan-Jul 2016

Table 5: Infection Control and Response

		current regulatory or licensing oversight in Massachusetts healthcare facilities, the healthcare inventory survey described in Table 5, item 1 above will ask facilities to identify participation in healthcare facility accreditation programs. With respect to regulatory requirements or standards to provide infection prevention education and training and certification, currently in Massachusetts, there are no state requirements for this type of training. As described in Table 3, item 4, MDPH will explore and investigate current infection prevention and control education and training standards or requirements in MA healthcare facilities by collecting information from APIC, HICPAC, SHEA and other organizations on best practices and standards for education and training. In addition, MDPH will collect information from other states (e.g., NY, CA, TN, NC, SC) that require education and training to inform MDPH's process. Using the information collected, MDPH will explore the feasibility of promulgating state regulations requiring provision of infection prevention and control education and training as a condition for professional licensure. This exploration will include input from the Massachusetts HAI TAG, and MDPH will also interview representatives of the MA Board of Registration in Medicine and MDPH Division of Health Professions Licensure and its component boards.	
		<i>Other activities or descriptions:</i>	
		3. Assess readiness of Ebola-designated facilities within the state	

Table 5: Infection Control and Response

☒	☐	i. Use CDC readiness assessment tool and determine gaps in infection control In 2015, the Massachusetts Office of Preparedness and Emergency Management coordinated the initial Ebola preparedness assessments in the five designated Ebola treatment hospitals in Massachusetts. In 2016, follow-up Ebola preparedness assessments will be coordinated by MDPH. Data collected from these assessments will be submitted to CDC. A summary report detailing the results of the follow-up assessments, including any gaps identified, will be provided to CDC.	2016
☒	☐	ii. Address gaps (mitigate gaps) All gaps in infection control and prevention preparedness identified in the 2016 Ebola preparedness assessments will be addressed. MDPH staff will work to provide or arrange any training that is needed to address identified gaps.	2016
☒	☐	iii. Conduct follow-up assessments Follow-up assessments will be conducted to assure that identified gaps have been mitigated and all training needs have been met.	2016-2017
		<i>Other activities or descriptions:</i>	
☒	☐	4. Assess outbreak reporting and response in healthcare facilities i. Use standard assessment tool and determine gaps in outbreak reporting and response	

Table 5: Infection Control and Response

☒	☐	The healthcare facility inventory survey described in Table 5, item 1 will ask facilities whether or not they report communicable and other infectious diseases as well as outbreaks of communicable diseases to the local boards of health in Massachusetts. For those healthcare facilities that do not effectively report communicable and infectious diseases, a follow-up question will ask about specific barriers to this reporting.	Jan-May 2016
☒	☐	ii. Address gaps (mitigate gaps) Gaps in outbreak reporting will be assessed based on the responses to the barrier questions (described directly above) on the healthcare facility inventory survey. MDPH will work to address these gaps by providing any needed assistance and education for the reporting of infectious diseases and outbreaks of communicable diseases.	May 2016-June 2016
☒	☐	iii. Track HAI outbreak response and outcome Massachusetts Virtual Epidemiologic Network (MAVEN) is a web-based disease surveillance and case management system that enables MDPH and local health to capture and transfer appropriate public health, laboratory, and clinical data efficiently and securely over the Internet in real-time. The system interfaces with Electronic Laboratory Reporting (ELR) efforts, has automatic (24/7/365) notification of state and local officials of any event requiring their attention and geographic information system (GIS) activities.	2006 and ongoing

Table 5: Infection Control and Response

		The MDPH Bureau of Health Care Safety and Quality requires healthcare facilities to report incidents and serious reportable events to the web-based IT system, Health Care Facility Reporting System (HCFRS). MAVEN and HCFRS are routinely monitored to identify HAI- related clusters or outbreaks. A system for MDPH cross bureau communication is well established.	
		<i>Other activities or descriptions:</i>	

Table 6: Targeted Healthcare Infection Prevention Programs

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Expand infection control assessments i. Expand assessments to other additional facilities and other healthcare settings and determine gaps in	

		infection	control	
		MDPH will conduct infection control assessments in dialysis facilities and long-term care facilities. CDC's infection control assessment tools for hemodialysis facilities and long-term care (LTC) facilities will be used for the assessments in these healthcare settings. In 2016, MDPH will conduct on-site dialysis center assessments in 80 hemodialysis settings in Massachusetts. Data collected from these assessments will be submitted to CDC.		Oct 2015 –July 2016
		Long term care facility infection control assessments will occur in FY 2017 and onsite assessment visits will be made to 75 LTC facilities. In 2018, onsite assessments will be completed for an additional 75 LTC facilities. Data collected from the LTC facility assessments will be submitted to CDC.		Aug 2016-July 2018
☒	☐	ii. Address gaps (mitigate gaps)		
		All gaps in infection control and prevention preparedness identified in the dialysis and long-term care facilities assessments will be addressed. MDPH staff will work to provide or arrange training needed to address identified gaps.		Aug 2016-July 2018
☒	☐	iii. Conduct follow-up assessments		
		<u>Dialysis Centers:</u> A plan for follow up assessments will be developed based on the results of the 2016 dialysis centers assessments.		Aug 2016-July 2017
		<u>Long Term Care Facilities:</u> In 2018, a plan for follow-up assessments will be developed based on the results of the		Aug 2017-July

Table 6: Targeted Healthcare Infection Prevention Programs

		2017 LTC care assessments. Data collection tools will be developed to track follow-up assessment data elements as needed.	2018
		<i>Other activities or descriptions:</i>	
☒	☐	2. Increase infection control competency and practice in all healthcare settings through training i. Incorporate general infection control knowledge and practice assessments of competency into state licensing board requirements, credentialing, and continuing education requirements for clinical care providers (e.g., medical license, admitting privileges) and/or licensing/accreditation requirements for healthcare facilities. MDPH is investigating current infection prevention and control education and training standards or requirements in MA healthcare facilities; collecting information from APIC, HICPAC, SHEA and other organizations on best practices and standards for education and training; and collecting information from several other states (e.g., NY, CA, TN, NC, SC), that already have state regulations to require provision of education and training in healthcare facilities to inform the MA process. Using the information collected, MDPH will explore the feasibility of promulgating state regulations to require provision of infection prevention and control education and training as a condition of licensure. Exploration will include seeking the input of the TAG and interviewing representatives of the MA Board of Registration in Medicine and MDPH Division of Health Professions Licensure. ii. Develop a sustainable training program based on CDC	2016
☒	☐		

Table 6: Targeted Healthcare Infection Prevention Programs

		guidance and technical assistance to perform training, prioritizing on-site train-the-trainer programs in key domains of infection control, including the incorporation of hands on evaluations and competency assessments of best practices and a system to monitor ongoing compliance and competency. MDPH is investigating current infection prevention and control education and training standards or requirements in MA healthcare facilities; collecting information from APIC, HICPAC, SHEA and other organizations on best practices and standards for education and training; and collecting information from several other states (e.g., NY, CA, TN, NC, SC), that already have state regulations to require provision of education and training to inform the MA process of developing training programs.	2016
☒	☐	3. Enhance surveillance capacity to improve situational awareness, describe emerging threats, and target onsite assessments to implement prevention programs i. Build capacity to analyze data reported by facilities in a defined region to allow for a comprehensive assessment of potential healthcare-associated infection threats, and communicate results with healthcare facilities. Currently, MDPH analyzes NHSN and other data by facility type and size, as well as by region of the state. MDPH can identify statistical outliers across a variety of variables and outcomes. Through the HAI Coordinator and epidemiologists of the Bureau of Infectious Disease and Laboratory Sciences, MDPH is in close communication with healthcare epidemiologists and infection preventionists across facilities and facility type.	Ongoing

Table 6: Targeted Healthcare Infection Prevention Programs

☒	☐	Implementation of provider utilization of MAVEN will enhance this communication regarding specific cases and situations. MAVEN also has automated geocoding functionality. Thus, the Department can monitor and interact with facilities in any region of the state. ii. Work with CDC to guide analytic direction and identify facilities for prioritized assessments/response MDPH looks forward to working with CDC to investigate, develop and implement mechanisms for identifying significant deviations from expected incidence of HAI, clusters across facilities and outbreaks.	2017
☒	☐	iii. Improve outbreak reporting capacity by developing an infrastructure that includes clear definitions of infectious threats of epidemiologic importance that are communicated to facilities MDPH expects to eventually extend use of the MAVEN Outbreak Module, which has served well in managing outbreaks, for joint management of healthcare-associated outbreaks with the involved facilities. MAVEN has the added advantage of allowing for shared records among authorized users (over 95% of the local health departments in MA are using the system) and facilities involved in outbreak investigation and management, using a secure web-based system. MDPH will develop mutually agreed upon case definitions with hospital epidemiology and infection prevention partners in consultation with CDC. Moving forward, these efforts will involve a larger spectrum of healthcare facility types to address the many different settings in which patients receive care.	
☒	☐		

Table 6: Targeted Healthcare Infection Prevention Programs

		iv. Implement a response plan to address potential emerging threats identified by using enhanced surveillance The Department is currently updating infectious disease response plans. These will be inclusive of HAI and emerging infections that have impact on healthcare facilities. Opportunities for enhanced surveillance include broadening the use of NHSN, enlarging utilization and functionality of MAVEN, and utilizing our electronic health record-based surveillance system, ESPnet enables medical practices and hospitals to provide automated, timely information about notifiable and other conditions, influenza-like illness and chronic diseases by using information in electronic health records. Users can use ESPnet to query their own data and allow queries from the Departments of Public Health. As ESPnet is deployed in outpatient and inpatient settings, and enhanced to new purposes, it can be used to extract data from electronic health records for HAI surveillance purposes using automated algorithms. As accountable care organizations come into full operation, access to electronic health records for public health surveillance will become even more powerful. Detailed information about ESPnet is available at http://esphealth.org/.	Ongoing
		<i>Other activities or descriptions:</i>	

Table 6: Targeted Healthcare Infection Prevention Programs

Appendix 1

The HHS Action plan identifies metrics and 5-year national prevention targets. These metrics and prevention targets were developed by representatives from various federal agencies, the Healthcare Infection Control Practices Advisory Committee (HICPAC), professional and scientific organizations, researchers, and other stakeholders. The group of experts was charged with identifying potential targets and metrics for six categories of healthcare-associated infections:

- Central Line-associated Bloodstream Infections (CLABSI)
- Clostridium difficile Infections (CDI)
- Catheter-associated Urinary Tract Infections (CAUTI)
- Methicillin-resistant Staphylococcus aureus (MRSA) Infections
- Surgical Site Infections (SSI)
- Ventilator-associated Pneumonia (VAP)

Following the development of draft metrics as part of the HHS Action Plan in January 2009, HHS solicited comments from stakeholders for review.

Stakeholder feedback and revisions to the original draft Metrics

Comments on the initial draft metrics published as part of the HHS Action Plan in January 2009 were reviewed and incorporated into revised metrics. While comments ranged from high level strategic observations to technical measurement details, commenters encouraged established baselines, both at the national and local level, use of standardized definitions and methods, engagement with the National Quality Forum, raised concerns regarding the use of a national targets for payment or accreditation purposes and of the validity of proposed measures, and would like to have both a target rate and a percent reduction for all metrics. Furthermore, commenters emphasized the need for flexibility in the metrics, to accommodate advances in electronic reporting and information technology and for advances in prevention of HAIs, in particular ventilator-associated pneumonia.

To address comments received on the Action Plan Metrics and Targets, proposed metrics have been updated to include source of metric data, baselines, and which agency would coordinate the measure. To respond to the requests for percentage reduction in HAIs in addition to HAI rates, a new type of metric, the standardized infection ratio (SIR), is being proposed. Below is a detailed technical description of the SIR.

Below is a table of the revised metrics described in the HHS Action plan. Please select items or add additional items for state planning efforts.

Metric Number and Label	Original HAI Elimination Metric	HAI Comparison Metric	Measurement System	National Baseline Established (State Baselines Established)	National 5-Year Prevention Target	Coordinator of Measurement System	Is the metric NQF endorsed?
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Metric Number and Label	Original HAI Elimination Metric	HAI Comparison Metric	Measurement System	National Baseline Established (State Baselines Established)	National 5-Year Prevention Target	Coordinator of Measurement System	Is the metric NQF endorsed?
1. CLABSI 1	CLABSI per 1000 device days by ICU and other locations	CLABSI SIR	CDC NHSN Device-Associated Module	2006-2008 (proposed 2009, in consultation with states)	Reduce the CLABSI SIR by at least 50% from baseline or to zero in ICU and other locations	CDC	Yes*
2. CLIP 1 (formerly CLABSI 4)	Central line bundle compliance	CLIP Adherence percentage	CDC NHSN CLIP in Device-Associated Module	2009 (proposed 2009, in consultation with states)	100% adherence with central line bundle	CDC	Yes†
3a. C diff 1	Case rate per patient days; administrative/discharge data for ICD-9 CM coded <i>Clostridium difficile</i> Infections	Hospitalizations with <i>C. difficile</i> per 1000 patient discharges	Hospital discharge data	2008 (proposed 2008, in consultation with states)	At least 30% reduction in hospitalizations with <i>C. difficile</i> per 1000 patient discharges	AHRQ	No
3b. C diff 2 (new)		<i>C. difficile</i> SIR	CDC NHSN MDRO/CDA D Module LabID‡	2009-2010	Reduce the facility-wide healthcare facility-onset <i>C. difficile</i> LabID event SIR by at least 30% from baseline or to zero	CDC	No
4. CAUTI 2	# of symptomatic UTI per 1,000 urinary catheter days	CAUTI SIR	CDC NHSN Device-Associated Module	2009 for ICUs and other locations 2009 for other hospital units (proposed 2009, in consultation	Reduce the CAUTI SIR by at least 25% from baseline or to zero in ICU and other locations	CDC	Yes*

Metric Number and Label	Original HAI Elimination Metric	HAI Comparison Metric	Measurement System	National Baseline Established (State Baselines Established)	National 5-Year Prevention Target	Coordinator of Measurement System	Is the metric NQF endorsed?
				with states)			
5a. MRSA 1	Incidence rate (number per 100,000 persons) of invasive MRSA infections	MRSA Incidence rate	CDC EIP/ABCs	2007-2008 (for non-EIP states, MRSA metric to be developed in collaboration with EIP states)	At least a 50% reduction in incidence of healthcare-associated invasive MRSA infections	CDC	No
5b. MRSA 2 (new)		MRSA bacteremia SIR	CDC NHSN MDRO/CDA D Module LabID [‡]	2009-2010	Reduce the facility-wide healthcare facility-onset MRSA bacteremia LabID event SIR by at least 25% from baseline or to zero	CDC	No
6. SSI 1	Deep incision and organ space infection rates using NHSN definitions (SCIP procedures)	SSI SIR	CDC NHSN Procedure-Associated Module	2006-2008 (proposed 2009, in consultation with states)	Reduce the admission and readmission SSI [§] SIR by at least 25% from baseline or to zero	CDC	Yes [¶]
7. SCIP 1 (formerly SSI 2)	Adherence to SCIP/NQF infection process measures	SCIP Adherence percentage	CMS SCIP	To be determined by CMS	At least 95% adherence to process measures to prevent surgical site infections	CMS	Yes

* NHSN SIR metric is derived from NQF-endorsed metric data

[†] NHSN does not collect information on daily review of line necessity, which is part of the NQF

[‡] LabID, events reported through laboratory detection methods that produce proxy measures for infection surveillance

[§] Inclusion of SSI events detected on admission and readmission reduces potential bias introduced by variability in post-discharge surveillance efforts

[¶] The NQF-endorsed metric includes deep wound and organ space SSIs only which are included the target.

Understanding the Relationship between HAI Rate and SIR Comparison Metrics

The Original HAI Elimination Metrics listed above are very useful for performing evaluations. Several of these metrics are based on the science employed in the NHSN. For example, metric #1 (CLABSI 1) for CLABSI events measures the number of CLABSI events per 1000 device (central line) days by ICU and other locations. While national aggregate CLABSI data are published in the annual NHSN Reports these rates must be stratified by types of locations to be risk-adjusted. This scientifically sound risk-adjustment strategy creates a practical challenge to summarizing this information nationally, regionally or even for an individual healthcare facility. For instance, when comparing CLABSI rates, there may be a number of different types of locations for which a CLABSI rate could be reported. Given CLABSI rates among 15 different types of locations, one may observe many different combinations of patterns of temporal changes. This raises the need for a way to combine CLABSI rate data across location types.

A standardized infection ratio (SIR) is identical in concept to a standardized mortality ratio and can be used as an indirect standardization method for summarizing HAI experience across any number of stratified groups of data. To illustrate the method for calculating an SIR and understand how it could be used as an HAI comparison metric, the following example data are displayed below:

Risk Group Stratifier	Observed CLABSI Rates			NHSN CLABSI Rates for 2008 (Standard Population)		
Location Type	#CLABSI	#Central line-days	CLABSI rate*	#CLABSI	#Central line-days	CLABSI rate*
ICU	170	100,000	1.7	1200	600,000	2.0
WARD	58	58,000	1.0	600	400,000	1.5
$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{170 + 58}{100,000 \times \left(\frac{2}{1000}\right) + 58,000 \times \left(\frac{1.5}{1000}\right)} = \frac{228}{200 + 87} = \frac{228}{287} = 0.79 \quad 95\% \text{CI} = (0.628, 0.989)$						

*defined as the number of CLABSIs per 1000 central line-days

In the table above, there are two strata to illustrate risk-adjustment by location type for which national data exist from NHSN. The SIR calculation is based on dividing the total number of observed CLABSI events by an “expected” number using the CLABSI rates from the standard population. This “expected” number is calculated by multiplying the national CLABSI rate from the standard population by the observed number of central line-days for each stratum

which can also be understood as a prediction or projection. If the observed data represented a follow-up period such as 2009 one would state that an SIR of 0.79 implies that there was a 21% reduction in CLABSI overall for the nation, region or facility.

The SIR concept and calculation is completely based on the underlying CLABSI rate data that exist across a potentially large group of strata. Thus, the SIR provides a single metric for performing comparisons rather than attempting to perform multiple comparisons across many strata which makes the task cumbersome. Given the underlying CLABSI rate data, one retains the option to perform comparisons within a particular set of strata where observed rates may differ significantly from the standard populations. These types of more detailed comparisons could be very useful and necessary for identifying areas for more focused prevention efforts.

The National 5-year prevention target for metric #1 could be implemented using the concept of an SIR equal to 0.25 as the goal. That is, an SIR value based on the observed CLABSI rate data at the 5-year mark could be calculated using NHSN CLABSI rate data stratified by location type as the baseline to assess whether the 75% reduction goal was met. There are statistical methods that allow for calculation of confidence intervals, hypothesis testing and graphical presentation using this HAI summary comparison metric called the SIR.

The SIR concept and calculation can be applied equitably to other HAI metrics list above. This is especially true for HAI metrics for which national data are available and reasonably precise using a measurement system such as the NHSN. The SIR calculation methods differ in the risk group stratification only. To better understand metric #6 (SSI 1) see the following example data and SIR calculation:

Risk Group Stratifiers		Observed SSI Rates			NHSN SSI Rates for 2008 (Standard Population)		
Procedure Code	Risk Index Category	#SSI [†]	#procedures	SSI rate [*]	#SSI [†]	#procedures	SSI rate [*]
CBGB	1	315	12,600	2.5	2100	70,000	3.0
CBGB	2,3	210	7000	3.0	1000	20,000	5.0
HPRO	1	111	7400	1.5	1020	60,000	1.7
SIR = $\frac{\text{observed}}{\text{expected}} = \frac{315 + 210 + 111}{12600 \times \left(\frac{3.0}{100}\right) + 7000 \times \left(\frac{5.0}{100}\right) + 7400 \times \left(\frac{1.7}{100}\right)} = \frac{636}{378 + 350 + 125.8} = \frac{636}{853.8} = 0.74$		95%CI = (0.649,0.851)					

[†] SSI, surgical site infection

* defined as the number of deep incision or organ space SSIs per 100 procedures

This example uses SSI rate data stratified by procedure and risk index category. Nevertheless, an SIR can be calculated using the same calculation process as for CLABSI data except using different risk group stratifiers for these example data. The SIR for this set of observed data is 0.74 which indicates there's a 26% reduction in the number of SSI events based on the baseline NHSN SSI rates as representing the standard population. Once again, these data can reflect the national picture at the 5-year mark and the SIR can serve as metric that summarizes the SSI experience into a single comparison.

There are clear advantages to reporting and comparing a single number for prevention assessment. However, since the SIR calculations are based on standard HAI rates among individual risk groups there is the ability to perform more detailed comparisons within any individual risk group should the need arise. Furthermore, the process for determining the best risk-adjustment for any HAI rate data is flexible and always based on more detailed risk factor analyses that provide ample scientific rigor supporting any SIR calculations. The extent to which any HAI rate data can be risk-adjusted is obviously related to the detail and volume of data that exist in a given measurement system.

In addition to the simplicity of the SIR concept and the advantages listed above, it's important to note another benefit of using an SIR comparison metric for HAI data. If there was need at any level of aggregation (national, regional, facility-wide, etc.) to combine the SIR values across mutually-exclusive data one could do so. The below table demonstrates how the example data from the previous two metric settings could be summarized.

HAI Metric	Observed HAIs			Expected HAIs		
	#CLABSI	#SSI [†]	#Combined HAI	#CLABSI	#SSI [†]	#Combined HAI
CLABSI 1	228			287		
SSI 1		636			853.8	
Combined HAI			228 + 636 = 864			287+853.8 = 1140.8
$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{228 + 636}{287 + 853.8} = \frac{864}{1140.8} = 0.76 \quad 95\% \text{CI} = (0.673, 0.849)$						

[†] SSI (surgical site infection)

Appendix 2: Massachusetts Healthcare Associated Infections Technical Advisory Group

NAME	TITLE AND AFFILIATION	PHONE	EMAIL ADDRESS
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		NUMBER	
Chair			
Alfred DeMaria Jr. M.D.	Medical Director, Bureau of Infectious Disease and Laboratory Sciences State Epidemiologist <i>Massachusetts Department of Public Health</i>	617-983-6550	Alfred.demaria@state.ma.us
Members			
Karen Boudreau, MD	Chief Medical Officer Boston Medical Center HealthNet Plan		Karen.Boudreau@bmchp.org
Mari-Kim Bunnell, MD	OB/GYN New England Obstetrics and Gynecology Associates	617-731-3400	mbunnell@partners.org
Wanda Carey, RN, BSN, CIC	Infection Control Professional <i>Steward Healthcare, Norwood Hospital</i>	781-278-6326	wanda.carey@steward.org
Philip Carling, MD	Director Infectious Diseases and Hospital Epidemiology <i>Steward Healthcare, Carney Hospital</i>	617-296-4000 x 5050	Philip.Carling.MD@steward.org
Richard T. Ellison III, MD	Hospital Epidemiologist <i>U Mass Memorial Medical Center</i>	508-856-3158	ellisonr@ummhc.org
Paula Griswold, MS	Executive Director, <i>Massachusetts Coalition for the Prevention of Medical Errors</i>	781-272-8000 x152	pgriswold@mhalink.org
David Hooper, MD	Internal Medicine/ Infectious Disease <i>Massachusetts General Hospital</i>	617-726-3811	dhooper@partners.org
Tom Hutton	Healthcare Systems Preparedness Manager, Office of Preparedness and Emergency Management <i>Massachusetts Department of Public Health</i>	617-624-5289	Tom.Hutton@MassMail.State.MA.US
Linda Kenney	President, Executive Director <i>Medically Induced Trauma Support Services</i>	617-232-0090	Lkenney@MITSS.org
Tricia A. Lemon, BSN, MPH, CIC	Infection Prevention Manager <i>Mount Auburn Hospital</i>	617-499-5665 ext. 4253	tlemon@mah.harvard.edu
Tracy Stiles, PhD, D(ABMM)	Manager, the Bureau of Laboratory Sciences <i>Hinton State Laboratory Institute</i>	617-983-4362	Tracy.Stiles@MassMail.State.MA.US
NAME	TITLE AND AFFILIATION	PHONE NUMBER	EMAIL ADDRESS

Thomas Sandora, MD, MPH	Pediatric Infectious Disease <i>Children's Hospital Boston</i>	617-355-3858	thomas.sandora@childrens.harvard.edu
Mary Ellen Scales, RN, MSN, CIC	Chief Infection Control Officer <i>Baystate Health</i>	413-794-4782	maryellen.scales@bhs.org
Lynn Chase	Massachusetts QIO Program Director <i>Healthcentric Advisors</i>	781-419-2844	lchase@healthcentricadvisors.org
Pat Noga, Ph.D., RN, FAAN	Vice President, Clinical Affairs <i>Massachusetts Health and Hospital Association</i>	781-272-8000	pnoga@mhalink.org
Deborah Yokoe, MD, MPH	Hospital Epidemiologist <i>Brigham and Women's Hospital</i>	617-525-2689	dyokoe@partners.org

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