Michigan's Healthcare-Associated Infection Surveillance and Prevention Plan

The Michigan Department of Health and Human Services
Bureau of Disease Control, Prevention, and Epidemiology
Division of Communicable Diseases
Surveillance and Infectious Disease Epidemiology Section
Surveillance of Healthcare-Associated & Resistant Pathogens (SHARP) Unit

Executive Summary:

In response to the increasing concerns about the public health impact of healthcare-associated infections (HAIs), the US Department of Health and Human Services (HHS) has developed an Action Plan to help prevent HAIs. The HHS Action Plan includes recommendations for surveillance, research, communication, and metrics for measuring progress toward national goals. Three overarching priorities have been identified:

- Progress toward national prevention targets;
- Improve use and quality of the metrics and supporting systems needed to assess progress towards meeting the targets; and
- Prioritization and broad implementation of current evidence-based prevention recommendations

Background: The 2009 Omnibus bill required states who received Preventive Health and Health Services (PHHS) Block Grant funds to certify that they would submit a plan to reduce HAIs to the Secretary of Health and Human Services no later than January 1, 2010. In order to assist states in responding within the short timeline required by that language and to facilitate coordination with national HAI prevention efforts, the Centers for Disease Control and Prevention (CDC) created a template to assist state planning efforts. The original Michigan Department of Community Health HAI Surveillance and Prevention Plan was submitted to HHS in December 2009 and is available at http://www.michigan.gov/documents/mdch/MI_HAI_Plan_308688_7.pdf

Michigan's Healthcare-Associated Infection Surveillance and Prevention Plan (below) outlines the Michigan Department of Health and Human Services (MDHHS), Surveillance and Infectious Disease Epidemiology (SIDE) Section, Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit's HAI activities that are currently underway and those that will be considered if additional funding becomes available.

Many of these activities will be accomplished in conjunction with partner healthcare-related organizations, including the Michigan Health and Hospital Association (MHA) Keystone Center for Patient Safety and Quality, MPRO (Michigan's Quality Improvement Organization), the Michigan Society for Infection Prevention and Control (MSIPC), the Great Lakes Chapter of the Association for Professionals in Infection Control & Epidemiology (APIC-GL), the Michigan State Medical Society (MSMS), the Michigan Infectious Disease Society (MIDS), the South Central Association for Clinical Microbiology (SCACM), the Michigan Antibiotic Resistance Reduction Coalition (MARR), and Michigan Consumers for Healthcare.

Initial Federal emphasis for HAI prevention focused on acute care, inpatient settings, and then expanded to outpatient settings. The public health model of population-based healthcare delivery places health departments in a unique and important role in this area, particularly given shifts in healthcare delivery from acute care settings to ambulatory and long term care settings. In non-hospital settings, infection control and oversight have been lacking which have resulted in outbreaks which can have a wide-ranging and substantial impact on affected communities. At the same time, trends toward mandatory reporting of HAIs from hospitals reflect increased demand for accountability from the public.

Michigan's HAI Surveillance and Prevention Plan for 2015-2017 focuses on recruiting additional acute care facilities and beginning to recruit long term care and long term acute care facilities to share their HAI data with SHARP. For the Surveillance component of the Plan, MDHHS SHARP will collect and analyze data from participating hospitals. Collection of surveillance data will allow regional analysis of trends (and thus targeted reductions), and allow facilities to note 'community benchmark' data when comparing internal facility data. MDHHS's goal will be to increase the number of participating hospitals by 10% in this time period.

Currently, there are 104 hospitals who have signed a data use agreement (DUA), and 100 have conferred rights to the SHARP Unit in NHSN. This is 62% of total hospitals in the State of Michigan and includes 79% (86/109) of acute care hospitals, 47% (17/36) of critical access hospitals, and 25% (1/4) of rehabilitation hospitals. At this time there are no long-term acute care facilities participating in this surveillance initiative.

MDHHS began a Carbapenem-Resistant *Enterobacteriaceae* (CRE) Surveillance and Prevention Initiative in 2012 which has been highly successful. The initiative continues to grow and include more partners. The SHARP Unit initially recruited 21 facilities to voluntarily report CRE. That number has since expanded to 30 facilities. Michigan's CRE incidence rate was established and then decreased because of the prevention efforts made by Michigan's healthcare facilities. Additionally, MDHHS participates in existing HAI Prevention Collaboratives conducted by partner organizations which promote the use of evidenced-based practices to reduce the rates of HAI infections.

Michigan is one of 17 states that do not require mandatory reporting of HAIs. The Michigan HAI Surveillance and Prevention Plan will capitalize on valuable work currently underway throughout the state. Through the Surveillance and Prevention Initiatives outlined in more detail below, Michigan will strive to reach national 5-year Prevention Targets as identified in the HHS *Action Plan to Prevent Healthcare-Associated Infections* (HHS Action Plan).

Framework and Funding for Prevention of HAIs

CDC's framework for the prevention of HAIs builds on a coordinated effort of federal, state, and partner organizations and is based on a collaborative public health approach that includes surveillance, outbreak response, infection control, research, training, education, and systematic implementation of prevention practices. Legislation in support of HAI prevention provides a unique opportunity to strengthen existing state capacity for prevention efforts.

The 6 main target areas of the Michigan HAI Surveillance and Prevention Plan are listed below:

1. Enhance HAI Program Infrastructure
2. Surveillance, Detection, Reporting, and Response
3. Prevention
4. Evaluation, Oversight, and Communication
5. Infection Control Assessment and Response (Ebola-associated activity from FOA Supplement, CK14-1401PPHFSUPP15, Project A)
6. Targeted Healthcare Infection Prevention Programs (Ebola-associated activity from FOA Supplement, CK14-1401PPHFSUPP15, Project B)

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. The outline below describes Michigan's Plan for enhancing its state infrastructure to address HAIs. Michigan has had a strong HAI program since 2009.

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

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		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).	December 2009
☒	☐	ii. 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.	April 2015
☒	☐	iii. Engage HAI advisory committee in potential roles and activities to improve antibiotic use in the state (antibiotic stewardship)	January 2010-ongoing
☒	☐	iv. Engage HAI advisory committee in activities to increase health department's access to data and subsequently use those data in prevention effort	January 2010
☒	☐	v. Identify specific HAI prevention targets consistent with HHS priorities	January 2010
		Other activities or descriptions: MDHHS SHARP has convened a multi-disciplinary Advisory Group (referred to as the Michigan HAI Prevention Advisory Group).The Advisory Group includes representation from the MDHHS SHARP unit, the MDHHS Division of Emergency Preparedness and Response (DEPR), the Michigan Department of Licensing and Regulatory Affairs (LARA),	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		the Michigan Health & Hospital Association (MHA) Keystone Center for Patient Safety and Quality, the Michigan State Medical Society (MSMS), the Michigan Infectious Disease Society (MIDS), the Michigan Society for Infection Prevention & Control (MSIPC), the Great Lakes Chapter of Association of Professionals in Infection Control (APIC-GL), the Michigan Antibiotic Resistance Reduction (MARR) Coalition, Michigan's quality improvement organization — MPRO, the Michigan Association for Local Public Health (MALPH), the South Central Association for Clinical Microbiology (SCACM) and Michigan Consumers for Health (MCH).	
☒ ☒	☐ ☐	2. Establish an HAI surveillance prevention and control program i. Designate a State HAI Prevention Coordinator 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)	September 2009 September 2009
		Other activities or descriptions:	
☒	☐	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)	Ongoing
		Other activities or descriptions: In the grant funding cycle for 2015–2016, the Bureau of Laboratories (BOL) was awarded money to improve and expand capacity to perform confirmatory testing for mechanisms of CRE resistance. The BOL will be adding new primers (VIM and OXA-48) to confirm emerging CRE resistance in the state.	December 2015
☒	☐	4. 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	Ongoing/2016 — dependent on funding

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		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).	
		Other activities or descriptions:	

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. Metrics and targets for Ventilator-associated Pneumonia/Event are under development (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)

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)	Implementation Dates
		1. Improve HAI outbreak detection and investigation	
☒	☐	i. Work with partners including the Council of State and Territorial Epidemiologists (CSTE), CDC, state legislatures, and providers across the healthcare continuum to improve outbreak reporting to state health departments	September 2009
☒	☐	ii. Establish protocols and provide training for health department staff to investigate outbreaks, clusters, or unusual cases of HAIs.	Ongoing
☒	☐	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	Ongoing
☒	☐	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)	September 2009
		Other activities or descriptions: MDHHS SHARP collaborates with Local Health Departments and various healthcare settings (acute, long-term care, ambulatory care, outpatient) to provide guidance (infection control information, patient notification, risk assessments) in the event of outbreaks, clusters or unusual cases of HAIs. Through the efforts of our partner, the Michigan Antibiotic Resistance Reduction (MARR) Coalition, community educational programs about appropriate antibiotic use and	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		avoidance of antibiotic resistance have been developed for the general public, and students from elementary through high school. In addition to curricula development, MARR has also produced a public service announcement for television and in-flight media videos for three major U.S. airlines over the last year.	
☒ ☒	☐ ☐	2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues. i. Coordinate with laboratory to confirm emerging resistance patterns in HAI pathogens ii. In collaboration with MDHHS Bureau of Laboratories (BOL) and other clinical labs, support CDA/HL7 messaging of laboratory results	Ongoing Ongoing/2016 — dependent on funding
		Other activities or descriptions: MDHHS BOL was awarded ELC funding to purchase and validate confirmatory testing primers for VIM and OXA-48 (additional mechanisms of CRE resistance). Michigan BOL will then have capacity to look for KPC, NDM-1, VIM, and OXA-48 all of which are increasing in the United States, especially in the Midwest. MDHHS SHARP routinely collaborates with BOL colleagues to identify and confirm resistance patterns in HAI pathogens. Any suspected VISA or VRSA isolates are forwarded to the MDHHS BOL. Once at the lab the culture is confirmed and isolates are tested for the *vanA* gene. Through the efforts of our partner, the MARR Coalition, a project is underway with the Henry Ford Health System to develop a template for outpatient regional antibiograms with treatment guidelines for non-bacterial illnesses commonly treated in the outpatient setting.	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☒ ☒	☐ ☐	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 ii. Establish mechanisms or protocols for exchanging information about outbreaks or breaches among state and local governmental partners (e.g., State Survey and licensing agencies, communicable disease control)	Ongoing June 2014
		Other activities or descriptions: Healthcare facilities work with MDHHS SHARP and the local health department to identify/confirm and contain a possible outbreak in a facility. In Michigan, the definition of an outbreak is an increase above a facility's normal, baseline rate. For MRSA the definition is 3 or more epidemiologically linked, laboratory confirmed cases. LARA will notify the HAI coordinator of any infection control breaches identified during a State licensing survey using a standardized form developed by MDHHS SHARP.	
☒ ☒ ☒ ☒ ☒	☐ ☐ ☐ ☐ ☐	4. Identify at least 2 priority prevention targets for surveillance in support of the HHS HAI Action Plan i. Central Line-associated Bloodstream Infections (CLABSI) ii. *Clostridium difficile* Infections (CDI) iii. Catheter-associated Urinary Tract Infections (CAUTI) iv. Methicillin-resistant Staphylococcus aureus (MRSA) Infections v. Surgical Site Infections (SSI) vi. Ventilator-associated Events (VAE)	Ongoing Ongoing Ongoing Ongoing Ongoing Ongoing

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		Other activities or descriptions: MDHHS SHARP continues to collect NHSN surveillance data for CAUTI, CLABSI, SSI, VAP/VAE, MRSA, and CDI. Future statewide aggregate reports will include all these data, but focus on MRSA and CDI to ensure that all of the priority prevention targets have some statewide surveillance capacity in Michigan. Additionally, MDHHS SHARP maintains the carbapenem-resistant Enterobacteriaceae (CRE) Surveillance and Prevention Initiative. The Michigan Health and Hospital Association (MHA) Keystone Center collects NHSN surveillance data on multiple HAIs, but focuses efforts on CAUTI, CLABSI, and VAE. MPRO, Michigan's Quality Improvement Organization, focuses on CAUTI and CDI surveillance. The Michigan Surgical Quality Collaborative (MSQC) focuses on the reduction of SSIs in the state. This is a group of Michigan hospitals seeking to measure and improve the care of patients undergoing general and vascular surgery through sharing data and providing feedback in a transparent process to identify best practices related to quality measures including surgical infections.	
		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).	October 2009
☒	☐	ii. Establish baseline measurements for prevention targets	October 2009
		Other activities or descriptions: MDHHS SHARP uses national HHS target metrics to develop NHSN Targeted Assessment for	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		Prevention (TAP) reports for CAUTI, CLABSI, SSI (Overall, COLO, and HYST), MRSA bacteremia, and CDI. Moving forward, TAP reports will be available quarterly. Michigan hospitals will receive their individualized reports and de-identified aggregate bar charts ranking hospitals will be posted publicly. Through the efforts of our partner, the MARR Coalition, a project is underway with the Henry Ford Health System to develop a template for outpatient regional antibiograms with treatment guidelines for non-bacterial illnesses commonly treated in the outpatient setting.	
☒	☐	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
		Other activities or descriptions: MDHHS SHARP provides bi-monthly NHSN User Group calls to Michigan hospitals. Any hospital or long term care facility can attend these calls and receive training or answers to questions on NHSN. MDHHS SHARP will conduct regional in-person NHSN trainings for interested hospitals, primarily focusing on TAP reports. MDHHS SHARP, MHA Keystone, and MPRO will work together to provide in-person or webinar NHSN training on an as-needed basis.	
☒	☐	7. Develop tailored reports of data analyses for state or region prepared by state personnel.	January 2010 and quarterly thereafter
		Other activities or descriptions: MDHHS will produce and distribute tailored data reports to stakeholders and post de-	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		identified information on our website. MDHHS reports will include statewide and regional Targeted Assessment for Prevention (TAP) reports. MDHHS SHARP will provide voluntarily participating hospitals password-protected individual feedback reports. In order to avoid duplication of efforts, MHA Keystone will produce hospital-specific scorecards, and MPRO will produce hospital reports for 11th scope of work. Facilities who participate in the CRE Surveillance and Prevention Initiative receive monthly reports. These reports detail their facility-specific progress and overall initiative data. A regional report will be generated per emergency preparedness region that will highlight regional CRE incidence trends to be shared with all infection prevention and epidemiology personnel to improve regional awareness of CRE.	
		8. Validate data entered into HAI surveillance healthcare records review, parallel database comparison) to measure accuracy and reliability of HAI data collection	
☒	☐	i. Develop a validation plan	June 2010
☒	☐	ii. Pilot test validation methods in a sample of healthcare facilities	June 2011
☒	☐	iii. Modify validation plan and methods in accordance with findings from pilot project using the "National Healthcare Safety Network (NHSN) External Validation Guidance and Toolkit 2014"	August 2015
☐	☒	iv. Implement validation plan and methods in selection of healthcare facilities participating in HAI surveillance	Fall 2015
☐	☒	v. Analyze and report validation findings	Winter 2016-2017
☐	☒	vi. Use validation findings to provide operational	Winter 2016-2017

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		guidance for healthcare facilities that targets any data shortcomings detected	
		Other activities or descriptions: The MDHHS SHARP Unit intended to validate NHSN data since it gained access. This project had been postponed due to limited funded and staff time. The SHARP Unit now hosts a CSTE HAI fellow from July 2015–July 2017 who will perform CLABSI and CAUTI data validation as a major project. A minimum of 18 acute care facilities will be sought for validation of 2014 ICU CLABSI and CAUTI data. From a list of all positive ICU cultures (blood/urine), up to 20 unique cases and up to 40 unique non-cases will be randomly reviewed. Denominator data will be validated through the assessment of daily device-day counting practices. Upon completion of the validation, facility specific reports will be generated and sent to facility staff. A final aggregated report will be written for public dissemination. Participation in the validation is voluntary and participating facilities will not be publically identified.	
☒	☐	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, suspect cases/clusters, and outbreaks	January 2010
		Other activities or descriptions: MDHHS follows an evidence-based practice outbreak response in consultation with the healthcare facility, and tailors it specifically to the HAI in question. a. Confirm the outbreak b. Establish case definitions c. Characterize by person, place and time d. Establish compliance to standard control measures e. Determine the need for active surveillance cultures	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		f. Determine the need for PFGE testing of available isolates g. Develop a corrective action plan h. Implement the plan i. Evaluate results j. Communicate findings k. Conduct on site consultations, as requested For example, the CRE Surveillance and Prevention Initiative Collaborative has developed a CRE Response Plan detailing steps in investigation and remediation. It can be found in Appendix 2. Work on specific non-outbreak HAI rate increases is based on a smaller number of hospitals having challenges. This process is driven by healthcare facility-specific data using outcome measures to determine which hospitals have opportunity for improvement. a. Review data b. Identify poor outcomes/increased rates c. Outreach to hospital regarding opportunity for improvement d. Site visit to diagnose barriers and root causes e. Rapid cycle improvement based on findings f. Monthly follow up to ensure improvement We also reference CDC provided outbreak materials: http://www.cdc.gov/hepatitis/outbreaks/index.htm; http://www.cdc.gov/hepatitis/outbreaks/healthcareinvestigationguide.htm; http://www.cdc.gov/hepatitis/outbreaks/toolkit.htm	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☒	☐	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.	Summer 2015
		Other activities or descriptions: In the spring of 2015, a representative from LARA joined the HAI prevention advisory group. LARA has stated that they are working on updating the State Administrative Rules and will add language regarding Infection Control competency requirements for providers. APIC-GL formed a subcommittee to propose and advocate for the nursing licensing board to have 1 contact hour of infection control education added to nursing continuing education. Our partner, the MARR Coalition is currently revising the 2009 "MARR Long Term Care Toolkit" that was originally based on the 2005 CDC's "12 Steps to Prevent Antimicrobial Resistance in Long Term Residents". All steps are being updated to reflect recent changes made by the CDC and AHRQ. In addition, MARR is expanding steps 6, 7 and 8 to include "Guidelines for Antibiotic Stewardship Programs in Long Term Care and Long Term Acute Care Facilities".	
☒	☐	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, hepatitis C, multi-drug resistant organisms (MDRO), and other reportable HAIs) across the spectrum of inpatient and outpatient healthcare settings	Ongoing

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☐	☒	ii. Promote definitional alignment and data element standardization needed to link HAI data across the nation.	When developed by CDC, CMS and/or AHRQ
		Other activities or descriptions: Collaborate with the Michigan Health Information Network (MIHIN) to capture data through the health information exchanges to improve surveillance through data definition standardization.	
☒	☐	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	January 2011
		Other activities or descriptions: MHA Keystone is planning a transparency website which will display hospital-identified HAI data, adapted from the HHS hospital compare website.	October 2015
☒	☐	13. Make available risk-adjusted HAI data that enable state agencies to make comparisons between hospitals.	July 2015
		Other activities or descriptions: MDHHS SHARP unit distributed their first annual Targeted Assessment for Prevention (TAP) report including 2014 data both in an aggregate bar graph and in individual feedback reports. These reports will be quarterly starting in 2015. TAP reports will continue to allow state agencies to view all hospitals (de-identified) on a bar chart for comparison. Hospitals are assigned a letter to view where they rank among all participating hospitals while maintaining hospital anonymity.	
☐	☒	14. Enhance surveillance and detection of HAIs in nonhospital settings	Fall 2016
		Other activities or descriptions: The ELC Ebola supplemental funds will allow us to expand our current involvement with non-hospital settings, including outpatient surgery centers,	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		dialysis and long term care facilities. While assisting in identifying needed improvement in infection control capacity in these setting, we will improve overall surveillance, detection and response capacity statewide. Through the efforts of our partner, the MARR Coalition, a project is underway with the Henry Ford Health System to develop a template for outpatient regional antibiograms with treatment guidelines for non-bacterial illnesses commonly treated in the outpatient setting.	
☐	☒	15. Recruit greater participation in voluntary NHSN surveillance initiative i. Increase acute care participation by 10% ii. Recruit long term acute care (LTAC) hospitals to share data iii. Increase skilled nursing facilities	 December 2017 December 2017 December 2017
		Other activities or descriptions: The SHARP Unit will contact long-term acute care hospitals by email and letter to encourage voluntary participation within NHSN. Skilled nursing facilities will be encouraged to join NHSN by the SHARP Unit, who will also provide training and resources. They will then be recruited to voluntarily share NHSN data with the SHARP Unit.	

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.

Outlined below are Michigan's planned activities for reducing the occurrence of HAIs.

Table 3: State planning for HAI prevention activities

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☒	☐	1. Implement HICPAC recommendations i. Develop strategies for implementation of HICPAC recommendations for at least 2 prevention targets specified by the state multidisciplinary group.	Ongoing
		Other activities or descriptions: Michigan is home to many renowned HAI prevention collaboratives: MHA Keystone: ICU (focus on VAE, Sedation, Delirium and Early Mobility & CLABSI); MHA Keystone Sepsis; MHA Keystone CAUTI (formerly HAI); and MSQC. These prevention collaboratives focus on implementation of HICPAC recommendations for CLABSIs, CAUTIs, MRSA, SSIs and VAEs. The CRE Collaborative is a multidisciplinary group that serves as an advisory group to the CRE Surveillance and Prevention Initiative. The CRE Collaborative helps direct prevention efforts as well as serve as technical experts for healthcare facilities across the continuum. The CRE Collaborative monitors incoming data and supports the implementation of best-practice recommendations that can be applied across the healthcare continuum.	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☒	☐	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	Ongoing
		Other activities or descriptions: Subcommittees of the MI HAI advisory group are created as needs are identified. To date, antimicrobial resistance and HAI prevention plan revision subcommittees have been convened. The CRE Collaborative group made up of infectious disease physicians, clinical microbiologists, infection preventionists, pharmacists, public health and quality improvement individuals, is also available to consult and advise any healthcare facilities needing assistance.	
☒ ☒ ☒	☐ ☐ ☐	3. Establish HAI collaboratives with at least 10 hospitals (this may require a multi-state or regional collaborative in low population density regions) i. Identify staff trained in project coordination, infection control, and collaborative coordination ii. Develop a communication strategy to facilitate peer-to-peer learning and sharing of best practices iii. Establish and adhere to feedback from standardized outcome data to track progress	January 2010
		Other activities or descriptions: Hospital engagement and collaboratives have a long history in Michigan. Prior to MDHHS SHARP, the MHA Keystone Center was created in 2003. It is unique in its ability to bring large number of hospitals together in a single improvement initiative and is the National standard for CUSP. MHA Keystone Center operates six collaboratives (including Keystone: HAI, Keystone: Surgery and Keystone: ICU) state wide. MDHHS SHARP unit began a NHSN surveillance initiative in 2010.	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
		Currently there are 104 hospitals voluntarily sharing their NHSN data. This accounts for 79% of licensed acute care facilities, 44% of critical access hospitals and 25% of licensed rehabilitation facilities in the state. MDHHS SHARP Unit began a Carbapenem-Resistant *Enterobacteriaceae* (CRE) Surveillance and Prevention Initiative, (with oversight from the CRE Collaborative group) in September 2012. The Initiative enrolled 17 acute care and 4 long-term acute care facilities throughout the state to voluntarily report cases of CRE. Since then, we have been able to determine statewide incidence rates for CRE which were previously unknown and decreased that incidence (statistically significant decrease). The initiative is now entering its 3rd year and has expanded to 24 acute care facilities and 6 LTACs.	
☒	☐	4. Develop state HAI prevention training competencies i. Consider establishing requirements for education and training of healthcare professionals in HAI prevention (e.g., certification requirements, public education campaigns, and targeted provider education) or work with healthcare partners to establish best practices for training and certification	2016
		Other activities or descriptions: LARA is updating the State Administrative Rules and will add language regarding Infection Control competency requirements for providers. APIC-GL formed a subcommittee to propose and advocate for the nursing licensing board to have 1 contact hour of infection control education added to nursing continuing education.	Summer 2016 Fall 2016
☒	☐	5. Implement strategies for compliance to promote adherence to HICPAC recommendations i. Coordinate/liaise with regulation and oversight activities such as inpatient or outpatient facility licensing/accrediting bodies and professional licensing organizations to prevent HAIs	May 2015

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☐	☒	ii. Improve regulatory oversight of hospitals, enhance surveyor training and tools, and add sources and uses of infection control data	Spring 2016
☐	☒	iii. 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	2017
		Other activities or descriptions: ELC Ebola Supplemental funds will allow MDHHS SHARP unit to expand infection prevention education and technical assistance. Over the course of the next 3 years ICAR activities will be conducted at long term care, outpatient and dialysis facilities.	
☒	☐	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)	September 2012
		Other activities or descriptions: As mentioned above in Table 3, part 3, MDHHS SHARP Unit began a Carbapenem-Resistant *Enterobacteriaceae* (CRE) Surveillance and Prevention Initiative, (with oversight from the CRE Collaborative group) in September 2012. The Initiative enrolled 17 acute care and 4 long-term acute care facilities throughout the state to voluntarily report cases of CRE and implement CRE prevention measures at their facilities. Since then, we have been able to determine statewide incidence rates for CRE which were previously unknown and decreased that incidence (statistically significant decrease) due to their prevention efforts. The initiative is now entering its 3rd year and has expanded to 24 acute care facilities and 6 LTACs. MDHHS SHARP will be recruiting additional facilities in 2016.	
☒	☐	7. Establish collaborative(s) to prevent HAIs in nonhospital settings (e.g., long term care, dialysis)	Ongoing
		Other activities or descriptions: MDHHS SHARP hopes to continue enrolling skilled nursing facilities (SNFs) in NHSN to collect CDI/MRSA data as well as additional LTACs for CRE surveillance and prevention efforts.	

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.

Table 4: State HAI communication and evaluation planning

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☒ ☒	☐ ☐	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 ii. Establish systems for refining approaches based on data gathered	Ongoing
		Other activities or descriptions:	
☒	☐	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	Ongoing
		Other activities or descriptions The State HAI plan is posted on our website. The SHARP unit produces annual aggregate surveillance reports that are posted to our website and shared with the HAI Advisory Group.	
☒	☐	3. Provide consumers access to useful healthcare quality measures i. Disseminate HAI data to the public	Ongoing
		Other activities or descriptions: In addition to MDHHS SHARP aggregate reports mentioned previously, the MHA is planning a transparency	

		website which will display Michigan hospital-identified HAI data, adapted from the HHS hospital compare website. Other common sources for publicly available healthcare quality measures for consumers i. Hospital Compare at http://www.hospitalcompare.hhs.gov/hospital ii. Hospital Inform at www.mihospitalinform.org iii. Greater Detroit Area Health Council at http://www.gdahc.org/content/gdahc-annual-reports iv. Agency for Healthcare Research & Quality (AHRQ) at http://www.ahrq.gov/data/hcup v. Nursing Home Compare at http://www.medicare.gov/NHCompare vi. Healthgrades at http://www.healthgrades.com vii. Commonwealth Fund at http://WhyNotTheBest.org viii. Michigan Consumers for Healthcare at http://www.consumersforhealthcare.org/ ix. MARR Consumer Programs and Materials at http://www.mi-marr.org/materials.php x. Individual hospital websites occasionally provide quality/safety data. Consumers are encouraged to check hospital websites for more information.	
☒	☐	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	2010
☒	☐	5. Work with State Public Information Officer (PIO) to communicate newsworthy HAI events	Ongoing
		Other activities or descriptions:	

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)	Implementation Dates
☒	☐	1. Create an inventory of all healthcare settings in state. List must include at least one infection control point of contact at the facility	October 2015
☒	☐	2. Identify current regulatory/licensing oversight authorities for each healthcare facility and explore ways to expand oversight	October 2015
		Other activities or descriptions: MDHHS is collaborating with the Division of Emergency Preparedness and Response (DEPR) and LARA to create the inventory of all health care settings.	
☒	☐	3. Assess readiness of Ebola-designated facilities within the state i. Use CDC readiness assessment tool and determine gaps in infection control	Ongoing
☐	☒	ii. Address gaps (mitigate gaps)	Summer 2015–Ongoing
☐	☒	iii. Conduct follow-up assessments	March 2017
		Other activities or descriptions: Michigan is assembling a team to assess Special Pathogen Response Network (SPRN) hospitals. Team members will be multi-disciplinary with backgrounds in infection prevention and control, laboratory, PPE and medical waste management. The Ebola REP team visited Michigan in February 2015 and assisted 4 hospitals. Assessment facility assists began in August, 2015. CDC ERA team will assist the MDHHS team on 3 assessment facility visits. Once staff is hired and trained, MDHHS will continue to coordinate visits, first with remaining treatment facilities (Tier 2), followed by assessment facilities	

		(Tier 3) and then continuing with frontline facilities (Tier 4). Each facility will receive recommendations about strengths and identified gaps specific to Ebola planning. We will work with facility leadership to mitigate identified gaps and will follow up to ensure hospitals are ready to handle any special pathogen.	
☐ ☐ ☐	☒ ☒ ☒	4. Assess outbreak reporting and response in healthcare facilities i. Use standard assessment tool and determine gaps in outbreak reporting and response ii. Address gaps (mitigate gaps) iii. Track HAI outbreak response and outcome	When developed by CDC DHQP
		Other activities or descriptions: As tools become available from CDC DHQP, MDHHS SHARP unit staff will assist facilities to strengthen their infection prevention and control programs in MI.	

Table 6: Targeted Healthcare Infection Prevention Programs

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Implementation Dates
☐ ☐ ☐	☒ ☒ ☒	1. Expand infection control assessments i. Expand assessments to other additional facilities and other healthcare settings and determine gaps in infection control ii. Address gaps (mitigate gaps) iii. Conduct follow-up assessments	April 2016
		Other activities or descriptions: Technical assistance will be offered to frontline and other healthcare facilities as well as all Ebola assessment facilities. These assistance visits will occur concurrently based on NHSN data, population density and geography.	

☒ ☐	☐ ☒	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. ii. Develop a sustainable training program based on CDC 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.	2016 Summer 2016
		Other activities or descriptions: As mentioned above, LARA is planning on amending the State Administrative rules to state that providers have some infection prevention education on an annual basis. Additionally, APIC-GL has developed a campaign to amend nursing continuation education requirements to include a mandatory infection prevention credit. Our partner, the MARR Coalition is currently revising the 2009 "MARR Long Term Toolkit" that was originally based on the 2005 CDC's "12 Steps to Prevent Antimicrobial Resistance in Long Term Residents". All steps are being updated to reflect recent changes made by the CDC and AHRQ. In addition, MARR is expanding steps 6, 7, and 8 to include "Guidelines for Antibiotic Stewardship Programs in Long Term Care and Long Term Acute Care Facilities". Once the National Ebola Training and Education Centers have established course schedules, funding may be made available by MDHHS SHARP to staff Ebola assessment facilities to attend courses.	
		3. Enhance surveillance capacity to improve situational awareness, describe emerging threats, and target onsite assessments to implement prevention programs	Ongoing

☒ ☒ ☒ ☒	☐ ☐ ☐ ☐	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. ii. Work with CDC to guide analytic direction and identify facilities for prioritized assessments/response iii. Improve outbreak reporting capacity by developing an infrastructure that includes clear definitions of infectious threats of epidemiologic importance that are communicated to facilities iv. Implement a response plan to address potential emerging threats identified by using enhanced surveillance	
		Other activities or descriptions: MDHHS SHARP has maintained capacity to analyze NHSN data. Beginning in 2015, both NHSN surveillance TAP reports and CRE Surveillance and Prevention Initiative reports will begin to display aggregate rates by region to better inform HAI prevention efforts. As mentioned above in Table 2, item 9, MDHHS SHARP follows an evidence-based practice outbreak response in consultation with the healthcare facility, and tailors it specifically to the HAI in question.	

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 Events (VAE)

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.

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	CLABSIs 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 *Clostridium difficile* Infections	Hospitalizations with *C. difficile* per 1000 patient discharges	Hospital discharge data	2008 (proposed 2008, in consultation with states)	At least 30% reduction in hospitalizations with *C. difficile* per 1000 patient discharges	AHRQ	No
3b. C diff 2 (new)		*C. difficile* SIR	CDC NHSN MDRO/CDAD Module LabID‡	2009-2010	Reduce the facility-wide healthcare facility-onset *C. difficile* 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	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 ?
				(proposed 2009, in consultation 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/CDAD 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 quite 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

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{170+58}{100000\times\left(\frac{2}{1000}\right)+58{,}000\times\left(\frac{1.5}{1000}\right)} = \frac{228}{200+87} = \frac{228}{287} = 0.79$$

95%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 CLABSIs 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

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{315+210+111}{12600\times\left(\frac{3.0}{100}\right)+7000\times\left(\frac{5.0}{100}\right)+7400\left(\frac{1.7}{100}\right)} = \frac{636}{378+350+125.8} = \frac{636}{853.8} = 0.74$$

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.

	Observed HAIs			**Expected HAIs**		
HAI Metric	**#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
SIR = $\frac{\text{observed}}{\text{expected}} = \frac{228+636}{287+853.8} = \frac{864}{1140.8} = 0.76$ 95%CI = (0.673,0.849)						

† SSI (surgical site infection)

Appendix 2

Michigan Department of Health and Human Services
Communicable Disease Division
Surveillance and Infectious Disease Epidemiology Section
Surveillance for Healthcare-Associated and Resistant Pathogens Unit

Carbapenem-Resistant *Enterobactericeae* Surveillance and Response

Background

1) **Introduction**
2) **Purpose**

Procedures

3) **Investigation Response**
    - **Surveillance Initiative-based**
    - **Laboratory-based**

4) **Communications**
    - **MDHHS to Lab**
    - **MDHHS to Facility**
    - **MDHHS Internal**
    - **MDHHS External**
    - **MDHHS to CDC**

5) **Concluding Actions**

1) Introduction

The Michigan Department of Health and Human Services (MDHHS) Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit developed the CRE Surveillance and Response Plan as an appendix to Michigan's Healthcare Associated Infection Surveillance and Prevention Plan. CRE infections are not mandated to be reported in Michigan but may fall under the 'unusual disease or occurrence' category of the Public Health Code. However, reporting of these infections would only capture infections new to a facility and not infections in facilities where CRE are already endemic. In 2012, Michigan began a CRE Surveillance and Prevention Initiative where participating facilities voluntarily report cases of CRE that fall within a certain surveillance definition (i.e., *Klebsiella pneumoniae* and *Escherichia coli* that are non-susceptible (resistant or intermediate) to ANY carbapenem – please see page XX). This enabled Michigan to determine a baseline of CRE incidence. Facilities then implemented CRE Prevention plans in their facilities and began remeasurement of incidence. CRE incidence has been decreasing in Michigan. However, with the detection of novel carbapenemases in the state, surveillance must continue and expand to include additional facilities.

The focus of this document is on procedures conducted by SHARP unit staff in how to investigate, coordinate, and communicate investigations of novel CRE and/or outbreaks of CRE.

2) Purpose

The purpose of this document is to clarify the SHARP Unit's, more specifically the CRE Prevention Coordinator's, investigative and communication responsibilities during a novel CRE or outbreak investigation and response. The plan outlines procedures specific to MDHHS in a multi-disciplinary, multi-facility investigation.

3) Investigation Response

Investigations of novel CRE and outbreaks are often a multi-disciplinary response consisting of epidemiology, infection prevention and laboratory. The bullets below briefly outline the role and responsibility of the CRE Prevention Coordinator and/or SHARP Unit in the investigation process depending on how the information was discovered.

Surveillance Initiative – based identification
(CRE identified via active surveillance at participating facility)

- Notify MDHHS BOL of the novel CRE or outbreak situation

    - Help coordinate getting the isolate from the clinical lab to MDHHS BOL for confirmatory testing

- Assist Infection Prevention at affected facility
    - Verify facility has laboratory confirmation
- Review CRE Acute Care Data Collection Form
    - Inquire about recent travel in the past 12 months (country, if sought medical care, if so where)
    - Assess what other information may be needed
- Determine if patient is still admitted
    - Assess potential exposures (roommates, unit, equipment, procedures)
    - Identify screening or active surveillance needs
    - Verify appropriate control measures are in place
        - Assist with inter-facility communication, if appropriate
- Summarize the investigation information

Laboratory-based identification
(CRE Prevention Coordinator receives lab confirmation from MDHHS or CDC)

- Notify Infection Prevention at affected facility
    - Send facility laboratory confirmation from MDHHS or CDC
- Provide (to facilities not participating in the Initiative) or review CRE Acute Care Data Collection Form
    - Inquire about recent travel in the past 12 months (country, if sought medical care, if so where)
    - Assess what other information may be needed
- Determine if patient is still admitted
    - Assess potential exposures (roommates, unit, equipment, procedures)
    - Identify screening or active surveillance needs
    - Verify appropriate control measures are in place
    - Assist with inter-facility communication, if appropriate
- Summarize the investigation information

4) Communications

Triggers and procedures for when investigational information should be shared between partners

MDHHS to Lab

- SHARP receives notification of novel CRE or outbreak situation from participating facility
    - Send email or call: Jim Rudrik, Marty Soehnlen, Kelly Scott, and Carrie Anglewicz
- If/when isolates may be sent for confirmatory test

MDHHS to Facility

- SHARP receives laboratory confirmation of novel CRE or outbreak situation from MDHHS BOL or CDC
    - Call infection prevention and/or clinical lab (submitter) at affected facility

MDHHS Internal

- Once SHARP has enough information to share (i.e., lab confirmation and sufficient epi information)
    - Send email to: SHARP Unit, BOL (see above), Jay Fiedler, Jim Collins, Jevon McFadden, Eden Well, Corinne Miller and the facility's/jurisdiction's regional epidemiologist

MDHHS External

- Once SHARP has enough information to share (i.e., lab confirmation and sufficient epi information)
    - Send email to: CRE Collaborative workgroup members and initiative partners, if appropriate
        - Do NOT use facility identifiers

MDHHS to CDC

- Once SHARP has enough information to share (i.e., lab confirmation and sufficient epi information)
    - Send email to: Alex Kallen and Jason Snow
        - Do NOT use facility identifiers

5) Concluding Actions

After the investigation is complete and all communications are made, summary excel files will be updated with the pertinent information and saved. All novel/CRE and outbreak responses will be needed for reference when writing the ELC grant.