Template for State Healthcare-associated Infection Plan

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 Healthcare-associated Infections. 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 5-year national prevention targets (e.g., 50-70% reduction in bloodstream infections);
- 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 not later than January 1, 2010. In order to assist states with responding during 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.

This template helps to ensure progress toward national prevention targets as described in the HHS Action Plan. CDC is leading the implementation of recommendations on national prevention targets and metrics and states should tailor the plan to their state-specific needs.

Initial 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.

The State HAI Action Plan template targets the following areas:
1. Enhance HAI Program Infrastructure
2. Surveillance, Detection, Reporting, and Response
3. Prevention
4. Evaluation, Oversight, and Communication

    With new Ebola-related, infection control activities, the following two tables have been added to reflect those activities:
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)

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.

Template for developing HAI plan

The following template provides choices for enhancing state HAI prevention activities in the six areas identified above. For each section, please choose elements which best support current activities or planned activities. Current activities are those in which the state is presently engaged and includes activities that are scheduled to begin using currently available resources. Planned activities represent future directions the state would like to move in to meet currently unmet needs, contingent on available resources and competing priorities. A section for additional activities is included to accommodate plans beyond the principal categories.

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).	Q3 2009 On going

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	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. iii. NEW: Engage HAI advisory committee in potential roles and activities to improve antibiotic use in the state (antibiotic stewardship) iv. NEW: Engage HAI advisory committee in activities to increase health department's access to data and subsequently use those data in prevention efforts	October 1, 2015
☒	☐	iv. Identify specific HAI prevention targets consistent with HHS priorities	Q3 2009 On going
		Other descriptions: In 2009, there were more than twenty-one groups and organizations focused on patient safety in Ohio. Most had at least one goal associated with HAIs. Over time, the groups merged, consolidated and new groups emerged. The ODH Director's Advisory Committee on Emerging Infections is a multidisciplinary group first brought together in the mid-1990s to address current and emerging infectious disease issues. Membership consists of representatives from the Infectious Disease Society of Ohio, five local chapters of the Association for Professionals in Infection Control and Epidemiology (APIC), local public health departments, academia, the Ohio State University Prevention Epicenter, Ohio Hospital Association, the Ohio Medicare quality improvement organization, and additional stakeholders interested in the reduction of HAIs. In 2015, HAI became a separate group, growing out of the ODH Director's Advisory Committee on Emerging Infections. This separation allows each group to focus on their respective area. The official name of the HAI group is the ODH	

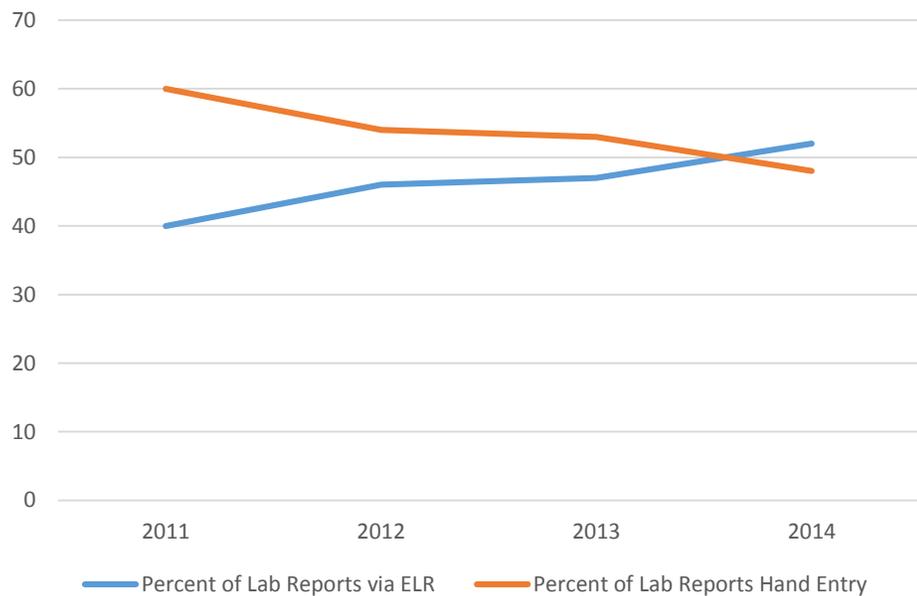| Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		HAI Advisory Group. Membership is comprised of APIC chapter presidents or their representatives, one hospital laboratorian, regional healthcare coordinators funded under the ODH Office of Health Preparedness (OHP), Antimicrobial Resistance Coordinator, Ohio Hospital Association (OHA), Health Services Advisory Group (HSAG) and other stakeholders interested in the reduction of HAIs. Additional representatives from hospital and public health laboratories will be invited to participate in 2016, to better reflect the importance of integrating partnerships, preparedness and antimicrobial stewardship initiatives. The goal of the HAI Advisory Group is to promote quality improvement and HAI prevention.	

☒ ☒	☐ ☐	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)
			2009
			Ongoing
			2009
			Ongoing

		Other descriptions: Marika Mohr, MS, RN, CIC, is Ohio's HAI Coordinator. Her position is funded at 0.8 Full-Time Equivalent (FTE). Ms. Mohr is a nurse who earned her master's degree in preventive medicine from Ohio State University. She has worked in infectious disease surveillance and epidemiology since 2000. In 2013, Ms. Mohr earned her certification in infection control (CIC). Ms. Mohr provides infection control technical assistance for infectious disease reporting, healthcare associated outbreak response, and continuous quality improvement through the prevention of HAIs. Kathleen Koechlin, PhD, MPH, BSN, RN, assumed the role of Antimicrobial Resistance Coordinator in 2014. She promotes antibiotic stewardship through	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		collaborations with medical, nursing and schools of pharmacy for the development of curricula that promote appropriate antibiotic prescribing practices, and by working with public health officials at the local level to build regional coalitions that address increased awareness of multi-drug resistant organisms. Viola Webber, BSN, RN. Ms. Webber is responsible for the coordination of shared activities for Ebola and other special pathogens in the Bureau of Infectious Diseases and the Office of Health Preparedness. She organizes on-site hospital assessments and reviews protocols for Ohio's Ebola Treatment Center and Ebola Assessment Hospitals. Ms. Webber is a member of the ODH Ebola hospital assessment team. Maureen Murphy-Weiss, BSN, RN, CPM, is the state TB Controller and Supervisor for the ODH TB/HAI Program. ODH staff referenced above report directly to Ms. Murphy-Weiss. She is funded 0.5 FTE for the HAI Program. In her role, Ms. Murphy-Weiss provides supervision and oversight to promote the integration of activities with shared goals and objectives for HAI. Her responsibilities also include capacity-building, program evaluation, communication, and technical support for issues pertaining to isolation and quarantine.	

☒	☐	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)	9/22/2008 Chlamydia & Gonorrhea 6/29/2009 Enterics 3/29/2010 Influenza 7/24/2013 HIV 7/18/2014 Mycobacteria
		Other activities or descriptions: The ODH laboratory (ODHL) supports investigations of healthcare-associated infection outbreaks and works closely with the HAI Coordinator. Submitted bacterial isolates are confirmed and characterized in greater detail than is feasible in the healthcare setting. Depending on the organism being investigated, this may include speciation and subtyping, polymerase chain reaction (PCR) analysis, toxin testing and pulsed-field gel electrophoresis (PFGE). High volume testing during an outbreak is possible for many organisms using PCR technology. The ODHL communicates results to CDC as requested by the HAI Coordinator. CDC provides select laboratory and antibiotic sensitivity data for specific organisms over the internet via password protected email. In the absence of dedicated funding, the laboratory currently has no capacity to confirm emerging resistance through susceptibility testing except for Tuberculosis. Sustain and enhance laboratory diagnostic capacity	

	- ODHL performs Pulsed Field Gel Electrophoresis (PFGE) on Acinetobacter, Klebsiella, MRSA and Enterobacter. The volume for each of the organisms varied depending on the number and type of outbreaks. For the five year period 2010-2014, the numbers (low, high, median) of PFGEs for each of these HAI organisms was as follows: Acinetobacter (0, 55, 0), Klebsiella (0, 27, 3), MRSA (11, 228, 19), Enterobacter (0, 5, 0). - Improve laboratory coordination and outreach/information flow - An evaluation is underway to replace the existing Laboratory Information Management System (LIMS) with a more modern robust system - ODHL shares with the CDC information on emerging/re-emerging infectious diseases, e.g., Ebola virus and novel influenza tests results, using a secure web-based messaging application. The Ohio Department of Health (ODH) is able to receive electronic laboratory reporting (ELR) from facilities that can submit electronic files that conform to CDC's HL7 Implementation Guide for electronic laboratory reporting to public health. Approximately 85% of laboratory results received via ELR are automatically processed into the Ohio Disease Reporting System (ODRS). The other 15% require manual processing due to items such as close name matches, new test codes, etc. In 2014, the most recent year data is available, ODH received 52% of all laboratory reports through ELR.	

Source of Lab Reports
Electronic Lab Reporting (ELR) vs Hand Entry
2011-2014

Chart showing Percent of Lab Reports via ELR (blue line) rising from 40 in 2011 to 52 in 2014, and Percent of Lab Reports Hand Entry (orange line) declining from 60 in 2011 to 48 in 2014.

Legend: — Percent of Lab Reports via ELR   — Percent of Lab Reports Hand Entry

☒	☐	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)	01/01/2015
		Other descriptions: HSAG, is Medicare Quality Improvement Network -Quality Improvement Organization (QIN-QIO) for Ohio. As the QIN-QIO for Arizona, California, Florida, Ohio, and the U.S. Virgin Islands, HSAG collaborates with patients, families, caregivers, hospitals, nursing homes, home health agencies, physician offices, and other stakeholders in order to improve healthcare.	

		During 2014, HSAG, ODH, OHA, the Ohio Department of Aging and other key stakeholders came together to form a collaborative that meets quarterly. The focus of this group is to improve quality of care and decrease cost of care by identifying and aligning data reporting and to decrease duplication of effort. In 2015, the quarterly collaborative created a crosswalk that provides an overview of how quality improvement initiatives are being implemented by each organization. Each section of the crosswalk is organized according to the task requirements in the Centers for Medicare & Medicaid Services (CMS) QIO contract. A high-level summary titled "At-A-Glance: Ohio Healthcare Quality Improvement" is available as a supplement to this crosswalk and may be used to provide the reader with a high level overview of the topics. In 2016, this collaborative plans to perform a more in-depth evaluation to identify how our respective agencies will work together to streamline crosswalk activities to minimize reporting burden.	
☒	☐	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.	Ongoing
		Other activities or descriptions: Enhance Health Information Technology (HIT) workforce • ODH continues to work on enhancing the ability of staff to work on informatics and health information technology projects. The ODRS coordinator participated in the year-long Informatics-Training in Place (I-	

| | TIPP) program. The program trains staff on how to manage health information technology projects, provides for networking and peer learning opportunities via several webinars and in-person meetings.

Advance electronic information exchange implementation
• Ohio is exploring the possibility of re-architecting or completely replacing Ohio's electronic infectious disease reporting system, the Ohio Disease Reporting System (ODRS), within the next several years. Although the functionality of ODRS mostly meets Ohio's needs, it is becoming very costly to keep the system running and to make small upgrades. Beginning in October 2015, Ohio will be actively scheduling demonstrations of surveillance systems used by other states.
• ODH plans to continue to maintain the current ELR system and make any upgrades necessary to confirm with national standards for ELR. Although many hospitals and reference laboratories report directly to ODH, some are reporting through one of Ohio's two health information exchanges (CliniSync and the Heath Collaborative). Once ELR data is received into ODRS, all local health departments and most hospital infection preventionists have immediate access.
• Several local health departments in Ohio have access to the electronic health records (EHR) of hospitals in their jurisdiction either through direct access to the EHR or via participation in one of the HIEs. If time and resources permit, ODH will conduct a survey to better understand how many health departments have access to EHRs from health care providers in their jurisdictions.

Sustain and enhance integrated surveillance information systems
• ODH will continue to maintain ODRS or move to another system that serves the same function. Currently, ODRS is interoperable with Ohio's syndromic surveillance system and is able to successfully transmit data to CDC for a variety of disease areas. | |

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.

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[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	TBD
☒	☐	ii. Establish protocols and provide training for health department staff to investigate outbreaks, clusters, or unusual cases of HAIs.	Ongoing Multiple Dates
☒	☐	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	07/16/2010 Last Reviewed 07/15/2015
☒	☐	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)	Draft 10/2013 Anticipated Finalized 01/2016

Other activities or descriptions:
Protocols for the public health outbreak investigation of HAI clusters or unusual cases are in place. Healthcare-associated outbreaks are investigated by local health department and facility staff with technical support from the Ohio Department of Health. Epidemiologists and nurses from local health departments participate in the outbreak investigations and attend statewide quarterly public health epidemiology meetings. Educational offerings on the topic of HAIs will be presented at least annually during the grant cycle at these epidemiology meetings. Ohio has developed an Infectious Disease Control Manual (IDCM) which includes HAI guidance. It is updated regularly and is available on ODH's website. Other educational opportunities to present healthcare-associated infection prevention and control information to public health (e.g. Combined Public Health Conference, Ohio Patient-Centered Primary Care Collaborative Quarterly newsletter) will be pursued as time and resources permit.

The HAI Outbreak Investigations chapter of the Ohio Infectious Disease Control Manual (IDCM) is reviewed regularly and updated as needed. It was last updated 01/2014.

ODH has an internal protocol for communicating information regarding outbreaks or infection control breaches detected in the course of routine public health business with ODH Office of Health Assurance and Licensing partners. Currently, ODH has procedures for how outbreaks are communicated with our partners, through the electronic Ohio Disease Reporting System (ODRS). Infection control breaches in and of themselves are not reportable events in Ohio, but are identified and addressed through outbreak investigation, as appropriate.

ODH Invasive Procedures Investigation protocol in undergoing final review and is expected to be finalized in 2015.

ODH HAI Outbreak Protocol is under development.

ODH use of National Healthcare Safety Network (NHSN) data is covered under the NHSN Data Use Agreement. Ohio's IT standard specifies the minimum requirements for information security in all agencies, and identifies the National Institute of Standards and Technology (NIST) Special Publication 800-53, revision 3 (NIST 800-53) as the framework for information security controls implementation for the state.

ODH specifically agrees that, to the extent permitted by State and Federal law, it will not release COVERED DATA requested under Ohio's open records laws; to media; for litigation purposes; that covered data is proprietary and if disclosed could cause competitive harm; or to anyone other than department staff or contractors who are explicitly authorized to use those data for surveillance and/or prevention purposes only.

The following State statutes, regulations, or policies provide additional safeguards that protect against the release of COVERED DATA:
- R.C. 149.43(A)(1)(v): "records the release of which is prohibited by state or federal law."
- R.C. 1333.61(D): "Trade secrets of certain county and municipal hospitals: "Trade secrets" are defined in the definitional section of Ohio's Uniform Trade Secrets Act.
- R.C. 1347.01 Personal Information
- R.C. 3701.17 Protected Health Information
- R.C. 1347.15 Confidential Information
- ODH Directive 7C – Use and Security of Agency IT Resources
- ODH Directive 23A – Information Technology and Sensitive Equipment Management
- ODH Directive 24B – Data Stewardship

	- ODH Directive 26B – Management and Security of ODH Authorized Equipment - ODH Directive 31B – Standards of Employee Conduct - ODH Directive 40A – Mobile Computing Device Policy Preliminary information from HAI Outbreak investigation is discoverable under Ohio Sunshine laws unless the investigation is deemed a Director's Journal Investigation. Under the Ohio Revised Code 3701-73-01, Director's Journal Investigations are protected until 6 months after the investigation is complete. The Ohio Department of Health has Health Insurance Portability and Accountability Act (HIPAA) compliant data systems to ensure protection of patient specific identifiable information. Facility and provider information may be protected during the initial outbreak investigation if the investigation is designated a director's investigation. Six months after completion of a director's investigation, facility and provider information will then become part of the public record. In 2009, HB 197 was passed. The bill required mandatory aggregate reporting of select hospital quality measures. Although ODH expected an increase in reporting of outbreaks, including the two prevention targets selected by the Director's Advisory Committee on Emerging Infections (i.e., *C. difficile* and MRSA), an increase was not observed. Ohio HB 197 was an unfunded mandate and data have not been collected since October 2013. Similar data are available on Centers for Medicare and Medicaid Services Hospital Compare website. There are no plans to reinstitute data collection in Ohio.	
☒ ☐	2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues.	
	Other activities or descriptions: Pulsed-Field Gel Electrophoresis (PFGE) on MRSA isolates from confirmed or suspect clusters is performed by the ODH Laboratory.	TBD

		ODHL is in the process of validating a real-time PCR to characterize Carbapenem-resistant Enterobacteriaceae (CREs); any new CRE testing will be performed on existing instrumentation. ODH Lab plans to send any HAI organisms that need to be tested for antibiotic susceptibilities to the CDC as requested on a case-by-case basis. There are currently no plans to implement in-house antibiotic sensitivity testing.	

☒ ☒	☐ ☐	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 agencies, Communicable Disease Control, state licensing boards)
			2012

		Other activities or descriptions: ODH will explore hosting a public health intern or Public Health Associate via CDC's Office for State, Tribal, Local and Territorial Support (OSTLTS) Public Health Associate Program to conduct a review of surveillance data to determine whether HAI outbreaks or transmission in healthcare settings has occurred. Healthcare Infection Control Practices Advisory Committee (HICPAC) guidance documents will be reviewed annually to see if state recommendations should be updated to prevent healthcare associated disease transmission.	

☐ ☒	☐ ☐	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)
			
			Q1 2010 ongoing

☐	☐	iii. Catheter-associated Urinary Tract Infections (CAUTI)	
☒	☐	iv. Methicillin-resistant Staphylococcus aureus (MRSA) Infections	Q1 2010 ongoing
☐	☐	v. Surgical Site Infections (SSI)	
☐	☐	vi. Ventilator-associated Pneumonia (VAP)	
		Other descriptions: In 2009, The Director's Advisory Committee on Emerging Infections identified two prevention targets consistent with HHS priorities: *Clostridium difficile* infection (CDI) and methicillin-resistant *Staphylococcus aureus.* In 2015, the ODH HAI Advisory Group continues to address these two important HAI prevention targets.	
☐	☒	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).	TBD
☒	☐	ii. Establish baseline measurements for prevention targets	2015
		Other activities or descriptions: Since 2009, ODH established a voluntary NHSN Group for MRSA and CDI. Membership has increased from 17 to 84 hospitals over the last six years. In 2014, ODH established an NHSN data user agreement with CDC, and are awaiting data. Upgrades to the federal database delayed access. When fully implemented, ODH will gain access to data for Ohio hospitals participating in CMS Quality measures. ODH provides annual updates on prevention targets using the Standardized Infection Ratio (SIR) and Cumulative Attributable Difference (CAD). Methodology is presented in the attached appendix. CDC will establish new baselines in 2015 for use in 2016.	
		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	07/2015 Ongoing

Other activities or descriptions:
On July 7, 2015, the HAI Coordinator provided training for HAI outbreak investigation using principles adapted from public health. There were 53 epidemiologists and nurses in attendance. This presentation was followed by a local health department presentation on a 2015 *Mycobacterium chelonae* keratitis outbreak that demonstrated application of material covered.

Evaluations showed 68% of attendees rated the presentations as good or excellent. Comments from the remainder of participants indicated they felt the presentation was too basic. Future presentations will be adapted for experienced participants to provide a more in-depth training. Training will include a table-top style exercise.

☐	☒	7. Develop tailored reports of data analyses for state or region prepared by state personnel	

Other activities or descriptions:
ODH is exploring the feasibility of featuring the CDC generated state HAI Progress Report on our website.

☐	☐	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 findings vi. Use validation findings to provide operational guidance for healthcare facilities that targets any data shortcomings detected	
		Other activities or descriptions: Ohio Department of Health does not have the authority or resources to validate NHSN HAI data.	
☐	☒	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	July 2016
		Other activities or descriptions: Preparedness plans for improved response to HAI reporting will be a product of the HAI Advisory Group. Regional Healthcare Coordinators, Regional Epidemiologists and communicable disease nurses from local public health are part of this advisory group.	
☐	☒	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.	As needed
		Other activities or descriptions: The Ohio HAI Coordinator will work with healthcare provider organizations (e.g. Ohio APIC chapters, Ohio Nurse Association, and other stakeholders) to include HAI prevention education in upcoming educational events or materials. Non-hospital ambulatory surgical centers will be the focus of infection control collaboration with DQA because Ohio licenses these facilities; whereas, it does not license hospitals.	
☐	☒	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 ii. Promote definitional alignment and data element standardization needed to link HAI data across the nation.	Ongoing
		Other activities or descriptions: Ohio has a strong commitment to improve data quality and to use data to inform decisions and policy. ODH applied for Public Health Accreditation Board (PHAB) and has required all local health departments to become accredited by 2020. Continuous quality improvement, integration and interoperability of surveillance systems define Ohio's approach to prevention and control of all infectious diseases, including HAIs. In 2015, ODHL purchased equipment and initiated validation for whole genome sequencing for select HAI pathogens. Ohio will use CDC, CSTE and NHSN definitions where not in conflict with Ohio law.	08/2015 and ongoing
☐	☒	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	TBD
		Other activities or descriptions: Ohio will explore using a MonAHRQ website to provide consumer friendly CMS data to the public.	
☐	☒	13. Make available risk-adjusted HAI data that enable state agencies to make comparisons between hospitals.	TBD
		Other activities or descriptions:	

Check Items Underway	Check Items Planned		Target Dates for Implementation
		If the MonAHRQ website is used, HAI data will be risk-adjusted to enable comparison of hospitals.	
☐	☒	14. Enhance surveillance and detection of HAIs in nonhospital settings	TBD
		Other activities or descriptions: Currently, non-hospital settings are held to the same standards of reporting as acute care facilities. Ohio is working with CDC and other state partners to develop a toolkit for HAIs and place the CDC approved tools on the ODH website as funding and resources permit. ODH will explore the feasibility of developing enhanced surveillance and HAI detection in non-hospital settings as funding and resources permit. The HAI Advisory Group recommended working with Ambulatory Surgical Centers and use the CDC tool to review infection control practices in these facilities.	

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.	08/2015

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Other activities or descriptions: Strategies for implementation of HICPAC recommendations for HHS priorities, MRSA and CDI, are recommended by the HAI Advisory Group.	
☐	☒	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	
		Other activities or descriptions: The HAI Advisory Group recommended a statewide survey of facility laboratories to determine the number of CRE detected in the past year. Following the survey, the results will be compiled into regional plan. CDC's 2012 CRE Toolkit - Guidance for Control of Carbapenem-resistant Enterobacteriaceae (CRE) will be distributed to local health departments and the prevention practices will be recommended based on the regional rates. The Ohio Patient Safety Institute (OPSI) is an organization dedicated to improving patient safety in Ohio. The Institute is a subsidiary of the Ohio Health Council, which was founded by the Ohio Hospital Association, the Ohio State Medical Association, and the Ohio Osteopathic Association. Through this collaboration, OPSI has the ability to work with over 180 hospitals and 9,000 physicians in Ohio to improve patient safety for all Ohioans. Ohio was not funded for CDC-sponsored prevention collaborative efforts, but is interested in identifying potential prevention collaboration projects with interested healthcare facilities, the Ohio Hospital Association and Health Services Advisory Group, as time and resources permit.	07/2016
		3. Establish HAI collaboratives with at least 10 hospitals (this may require a multi-state or regional collaborative in low population density regions)	

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 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	TBD
		Other activities or descriptions: ODH has been working closely with HSAG to develop a common operating picture of MRSA and CDI in acute care facilities. ODH has invited hospitals across the state to participate in the voluntary group. To date, 25 of 28 facilities have granted access to NHSN data to both organizations. For facilities that are experiencing higher than expected number of infections, ODH participates jointly with HSAG to provide public health resources to reduce infection rates. To be explored with OHA and HSAG. to determine need. Funding is not currently available for this activity.	
☒	☐	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	
		Other activities or descriptions: The Antimicrobial Resistance Coordinator is working with the Ohio State University, School of Medicine to develop benchmarks and objectives for incorporation into each year of the medical curriculum. This activity is focused on antibiotic prescribing practices. She is also working with public health officials at the local level to build regional coalitions that address increased awareness of multi-drug resistant organisms.	08/20/2015

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		5. Implement strategies for compliance to promote adherence to HICPAC recommendations	
☐	☐	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	
☐	☐	ii. Coordinate/liaise with regulation and oversight activities such as inpatient or outpatient facility licensing/accrediting bodies and professional licensing organizations to prevent HAIs	
☐	☐	iii. Improve regulatory oversight of hospitals, enhance surveyor training and tools, and add sources and uses of infection control data	
☐	☐	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	
		Other activities or descriptions: ODH does not have regulatory authority over Ohio hospitals in their entirety. As such, developing mandates for the standards for healthcare infection control and methods of data collection are not under consideration for future action.	
☐	☐	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)	
		Other activities or descriptions: Funding for state-sponsored collaborative efforts is not available at this time.	
☐	☐	7. Establish collaborative(s) to prevent HAIs in nonhospital settings (e.g., long term care, dialysis)	

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Other activities or descriptions: No planned activities at this time.	

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

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		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	

		Other activities or descriptions (not required): A landscape survey and an inventory of Ohio's healthcare facilities will be completed by July 31, 2016.	July 31, 2016
☒	☐	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	
		Other activities or descriptions: HAI Advisory Group members will discuss dissemination of the HAI prevention activities and propose best methods to reach healthcare partners and interested citizens.	July 31, 2016
☒	☐	3. Provide consumers access to useful healthcare quality measures i. Disseminate HAI data to the public	Ongoing
		Other activities or descriptions: Ohio data are available on Centers for Medicare and Medicaid Services Hospital Compare website	
☐	☒	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	
		Other activities or descriptions: The HAI Advisory Group will provide input and direction on potential projects related to safe injection practices and antimicrobial stewardship. ODH will follow up on pursuing resources and disseminating best practices through its website and via meetings and trainings.	

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 for Implementation (or currently underway)	Target Dates for Implementation

	Items Planned		
☐ ☐	☒ ☒	1. Create an inventory of all healthcare settings in state. List must include at least one infection control point of contact at the facility 2. Identify current regulatory/licensing oversight authorities for each healthcare facility and explore ways to expand oversight *Other activities or descriptions:* The Ohio Department of Health (ODH) licenses and\or registers health care providers, such as, ambulatory surgical centers, birthing centers, Clinical Laboratory Improvement Amendments (CLIA) labs, outpatient rehabilitation, dialysis centers, home health agencies, hospices, hospitals, Intermediate Care Facilities for Individuals with Intellectual Disabilities (ICF/IID), residential care facilities (assisted living), rural health clinics and nursing homes/facilities . ODH, Office of Health Assurance and Licensing (OHAL) maintains the Enhanced Information Dissemination and Collection (EIDC) electronic reporting system to track key facility personnel through a secure web-based portal. This system enables each facility to update information in near real-time. There is no fee for using EIDC for the end user. The HAI Coordinator proposes to work with OHAL to incorporate the infection preventionist directory and\or the Antibiotic Stewardship\Multiple Drug Resistant Organism (MDRO) Coordinator listing into the preexisting EIDC portal.	TBD

☒ ☐ ☐	☐ ☒ ☒	3. Assess readiness of Ebola-designated facilities within the state
		
		    i. Use CDC readiness assessment tool and determine gaps in infection control
		    ii. Address gaps (mitigate gaps)
			November 30, 2015

		iii. Conduct follow-up assessments	
		Other activities or descriptions: On June 1, 2015, Ohio had one Ebola Treatment Center (ETC) and 12 volunteer facilities to become Ebola Assessment Hospitals (EAH). On June 17, 2015, the CDC Readiness Assessment Tool (RAT) was distributed to these facilities with instructions to complete and return the RAT by July 3, 2015. As of July 14, 2015, the ETC and 10 of the self-designated EAH's have returned the RAT. Two facilities withdrew their from consideration. The ODH hospital Ebola assessment team has reviewed the RATs in preparations for site visits. As of 09/24/2015 a total of 4 EAHs and 1 ETC have had site visits. Written reports from on-site assessments will be sent to facilities in a timely manner after the assessments have been completed. Identified gaps in preparedness will be identified and followed up in a timely manner. The follow up may consist of a telephone call or on-site assessment if needed.	

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		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
			TBD

		Other activities or descriptions: The CDC has developed four standardized assessment tools to determine gaps in infection control practices, outbreak reporting and response. ODH staff have attended trainings on 3 of the 4 settings (acute care, long term care and dialysis). ODH will work on a development plan with local health partners and the HAI Advisory Group to determine the best way to utilize the tools.	

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
		  ii. Address gaps (mitigate gaps)
		  iii. Conduct follow-up assessments
		Other activities or descriptions:
		At this time, resources do not allow for expansion. ODH will consider as resources become available.	

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		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.	

		Other activities or descriptions:	

		At this time, resources do not allow for expansion. ODH will consider as resources become available.
☐	☐	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.
☐	☐	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: At this time, resources do not allow for expansion. ODH will consider as resources become available.

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?
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 (proposed 2009, in consultation with states)	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?
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

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{170+58}{100000 \times \left(\frac{2}{1000}\right) + 58{,}000 \times \left(\frac{1.5}{1000}\right)} = \frac{228}{200+87} = \frac{228}{287} = 0.79 \qquad 95\%\text{CI} = (0.628, 0.989)$$

[*]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 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

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{315 + 210 + 111}{12600 \times \left(\frac{3.0}{100}\right) + 7000 \times \left(\frac{5.0}{100}\right) + 7400\left(\frac{1.7}{100}\right)} = \frac{636}{378 + 350 + 125.8} = \frac{636}{853.8} = 0.74 \qquad 95\%\text{CI} = (0.649, 0.851)$$

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
$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{228+636}{287+853.8} = \frac{864}{1140.8} = 0.76 \qquad 95\%\text{CI} = (0.673, 0.849)$$						

† SSI (surgical site infection)