Iowa Department of Public Health

State Wide Action Plan for Healthcare Associated Infections

October 2015

IDPH
Iowa Department
of Public Health

Healthcare-Associated Infections: Healthcare-associated infections (HAIs) continue to be a health problem in the United States. Each year, 1.7 million infections occur[1], costing $28.4 billion to $33.8 billion[2]. Acquiring a healthcare-associated infection is a potential risk to anyone who has invasive medical treatment, surgery, is hospitalized, or otherwise receives care in a variety of healthcare settings. These settings can include hospitals, clinics, long term care facilities, dialysis centers, and rehabilitation facilities.

- HAIs are the most common complication associated with hospital care
- On any given day, 1 in 25 hospital patients has at least one HAI[3]
- In 2011, there were an estimated 721,800[3] HAIs in U.S. acute care hospitals

Public Health Action Plan and Funding for Prevention of HAIs: The public health model of population-based healthcare delivery places health departments in a unique and important role, particularly given shifts in healthcare delivery from acute care settings to ambulatory and long term care settings. In non-hospital settings, infection prevention and oversight have been lacking which resulted in outbreaks that can have a wide-ranging and substantial impact on affected communities.

IDPH received funding to support efforts to prevent and reduce healthcare-associated infections in Iowa. Grants include the Epidemiology & Laboratory Capacity for Infectious Diseases (ELC) Building and Strengthening Epidemiology and the ELC Ebola Supplement, both from the Centers for Disease Control and Prevention (CDC). IDPH chose to begin the action planning using the CDC template. CDC's framework for the prevention of HAIs builds on a coordinated effort of federal, state, and partner organizations. The framework is based on a collaborative public health approach that includes surveillance, outbreak response, research, training and education, and systemic implementation of prevention practices. Recent legislation in support of HAI prevention provides a unique opportunity to strengthen existing and expand state capacity for prevention efforts.

Conclusion and Contacts: IDPH encourages governmental agencies, healthcare providers, hospitals, and the public to review the **State Wide Action Plan for Healthcare-Associated Infections.**

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[1] Klevens RM, Edwards JR, Richards CL, Horan T, Gaynes R, Pollock D, Cardo D. Estimating healthcare-associated infections in U.S. hospitals, 2002. *Public Health Rep*, 2007;122:160-166.

[2] Bureau of Labor Statistics. BLS Handbook of Methods, Chapter 17, The Consumer Price Index. http://www.bls.gov/bls/fesacp1060906.pdf

[3] Magill SS, Edwards JR, Bamberg W, et al. Multistate Point-Prevalence Survey of Health Care-Associate Infections. *N Engl J Med* 2014;370;1198-208.

Mission: Improve healthcare-associated infection (HAI) outcomes in Iowa.

Vision: By 2019, improve healthcare-associated infection outcomes (quality, patient safety, patient experience, and cost) in all Iowa healthcare facilities by implementing prevention and coordination strategies between public health entities, healthcare facilities, and other organizations that share responsibility for HAI surveillance and prevention.

The Statewide Action Plan targets the following areas:
1. **HAI Program Infrastructure**
2. **Prevention**
3. **Harm Reduction**
4. **Community Care Coordination**
5. **Data**
6. **Communication and Education**

Key:
* "Items Underway" are those in which the state is presently engaged and include activities that are scheduled to begin using currently available resources.
* "Items Planned" are activities that represent future directions and are contingent on available resources and competing priorities.

Goal 1: Enhance HAI Program Infrastructure
In 2009, an HAI advisory council was established to develop a statewide plan to perform surveillance on HAIs and to determine best practices to reduce and prevent HAIs in Iowa. The HAI advisory council has remained active, and includes representatives from state and local public health, quality improvement organizations, and healthcare facilities.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation

☒	☐	1. Maintain a program for healthcare-associated infection (HAI) surveillance and prevention
		    A. Develop dedicated, trained HAI staff with at least one FTE to oversee HAI activities areas (integration, collaboration, and capacity building; reporting, detection, response, and surveillance; prevention; evaluation, oversight, communication, and infection prevention)
		    B. Conduct quarterly meetings with HAI Leadership Committee to address priorities and guide/implement activities
			Ongoing

☒ ☒ ☐	☐ ☐ ☒	C. Lead HAI Steering Committee meetings twice a year to review progress and establish/assess priorities D. Conduct needs assessment and/or evaluation of state HAI program to learn how to increase impact	
		Other activities or descriptions:	
		2. Establish statewide HAI prevention leadership through the formation of a multidisciplinary group or state HAI advisory council	Ongoing
☒	☐	A. Collaborate with local and regional partners (e.g., state hospital associations, professional societies for infection prevention and healthcare epidemiology, academic organizations, laboratorians, and networks of acute care hospitals and long term care facilities)	
☒	☐	B. 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	
☒	☐	C. Engage HAI advisory committee in potential roles and activities to improve antibiotic use in the state (Antibiotic Stewardship)	
☒	☐	D. Engage HAI advisory committee in activities to increase health department's access to data and subsequently use those data in prevention efforts	
		Other activities or descriptions:	

Goals 2: Prevention

Healthcare-associated infections are a major, yet often preventable, threat to patient safety. HAIs can lead to extended hospital stays, increased medical costs, and can be a cause of morbidity and mortality. To ensure prevention excellence, healthcare facilities and public health entities must improve identification and response to emerging threats, find new solutions for HAI prevention, and use evidence-based infection prevention practices.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation

☒ ☒	☐ ☐	1. Align Prevention Strategies
		   A. Improve coordination among government agencies or organizations that share responsibility for assuring or overseeing HAI activities to maximize resources and prevent duplication of efforts
		   B. Expand and coordinate HAI prevention strategies beyond the acute care setting to other venues such as ambulatory surgery, renal dialysis facilities, long term care facilities and home health care
		
		Other activities or descriptions:
			July 2015
			Ongoing

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		2. Develop Antibiotic Stewardship strategy
		   A. Include pharmacists in promoting stewardship
		   B. Promote evidence-based practices in Antibiotic Stewardship, such as resources from CDC's *Get Smart* and *Choosing Wisely* campaigns
		   C. Iowa HAI Steering Group and the Iowa Antibiotic Resistance Task Force will maintain outreach plans to raise awareness of Antibiotic Stewardship and decrease inappropriate antibiotic use
		   D. Develop and implement a patient and family engagement strategy around appropriate antibiotic use
		   E. Enlist the involvement of provider communities beyond the hospital setting in the development of community Antibiotic Stewardship programs
		   F. Promotion of Antibiotic Stewardship programs that target multidrug resistant organism (MDRO) reduction in healthcare settings
			July 2015
			Ongoing

		Other activities or descriptions:	

☒ ☒ ☒	☐ ☐ ☐	3. Stop transmission of vaccine-preventable diseases in healthcare settings
		    A. Promote evidence-based practices establishing healthcare worker immunization
		    B. Expand and coordinate immunization strategies for vaccine-preventable diseases beyond the acute care setting to ambulatory settings, including long-term care, provider office settings, and community care settings (i.e. home health)
		    C. Improve vaccinations status of populations through community efforts
		    D. Promote the use of the Iowa Immunization Registry Information System (IRIS) for tracking and assessment of immunization status for all community providers
			July 2015
			Ongoing

		Other activities or descriptions:	
☒	☐	4. Encourage use of good infection prevention practices A. Provide guidance and encourage routine use of infection prevention practices (e.g. hand hygiene, barrier precautions)	July 2015 Ongoing
		Other activities or descriptions:	

☒	☐	5. Improve HAI outbreak detection and investigation
		    A. Provide education and outreach to providers to raise awareness of outbreak recognition and reporting
		    B. Standardize outbreak reporting and investigation
			July 2014
			Ongoing

		Other activities or descriptions:	

Goal 3: Harm Reduction

Although preventative strategies can reduce the incidence of HAIs, measures should be in place to prepare for potential patient infections. Harm reduction strategies aim to keep people safe and minimize preventable death, disease, and injury. Improvements in adherence to evidence-based practices and use of toolkits, as well as promotion of education strategies, can lead to reductions in the prevalence of HAIs.

Several healthcare-associated infections have been identified as focus areas for prevention efforts, due to their high rate of occurrence and relevance to both urban and rural hospitals. Target areas for prevention include:

CLABSI: Central line-associated bloodstream infections (CLABSIs) can occur in conjunction with the use of a "central line" or "central catheter", a tube that is placed in a large vein in the patient's neck, chest, or groin. The catheter is used to draw blood or to give medications or fluids, but can leave patients susceptible to bloodstream infections, as germs can travel down the central line and enter the blood. Due to the seriousness of a CLABSI, it's particularly important that catheters are removed as soon as they are no longer needed.

CAUTI: Catheter-associated urinary tract infections (CAUTIs) are the most common type of HAI. In fact, of the 93,000 urinary tract infections that are acquired yearly in hospitals, 75% are associated with use of a urinary catheter[4]. When a patient is unable to urinate on their own or hospitals need to measure the amount of urine during a period of care, a catheter (tube) is inserted into the bladder to drain urine; however, germs can enter the urinary tract through the catheter and cause infection. To avoid CAUTIs, it's important that catheters are only used for appropriate indications and should be removed when no longer needed.

SSI: A surgical-site infection (SSI) is defined as an infection that occurs after surgery in the part of the body where the procedure took place. Out of every 100 patients who have surgery, 1 to 3 will develop an infection[5]. An SSI can sometimes be superficial, involving the skin only, but can become more serious if it involves tissues under the skin, organs, or implanted material. Based on the 2013 NHSN report, Iowa's surgical site infection SIR (see Appendix 1) was higher than the national SIR, and has thus been identified as an opportunity for improvement. Prevention efforts for this type of infection will be a priority.

CDI: *Clostridium difficile* is a bacterium whose spores can live outside the human body on surfaces like bed linens, bed rails, bathroom fixtures, or medical equipment, and can cause inflammation of the colon. In 2011, there were almost half a million *Clostridium difficile* infections (CDIs) in the U.S[6]. The bacteria are shed in feces, and can be spread when patients touch contaminated items or surfaces, or through hand contact with healthcare workers. Most at risk are people who take antibiotics, in particular elderly adults.

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[4] Magill SS, Edwards JR, Bamberg W, et al. Multistate Point-Prevalence Survey of Health Care-Associate Infections. *N Engl J Med* 2014;370;1198-208.

[5] http://www.cdc.gov/HAI/pdfs/ssi/SSI_tagged.pdf. Web. Accessed September 18, 2015.

[6] Lessa FC, Mu Y, Bamberg WM, et al. Burden of *Clostridium difficile* Infection in the United States. *N Engl J Med* 2015;372:825-834.

VAE: A ventilator-associated event (VAE) can occur in patients who need to use a ventilator, a machine to help the patient breathe by giving oxygen through a tube placed in the mouth, nose, or through a hole in the front of the neck. Complications can occur if germs enter the ventilator tube, and the patient can experience a significant and sustained deterioration in oxygenation. The criteria for identifying a VAE include decline in respiratory status after a period of stability or improvement on a ventilator, evidence of infection or inflammation, and laboratory evidence of respiratory infection.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
		Main Objective: Routinely achieve patient goals with zero tolerance for preventable harm and death	

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		1. Reduce Surgical Site Infections
		    A. Offer HAI education for ambulatory care centers, such as outpatient surgery centers
		    B. Promote adherence to evidence-based practices for the prevention of surgical site infections (e.g., Project Joints, WHO surgical safety checklist, SCIP compliance)
		    C. Align priority surgical site infection (colon, abdominal hysterectomy, total knee, total hip) procedures with national SSI prevention strategies
		
		 Other activities or descriptions:
			July 2014
			 Ongoing

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		2. Reduce Blood Stream Infections
		    A. Promote adherence to evidence-based practices for the prevention of central line-associated blood stream infections (e.g., insertion and maintenance bundles) and MRSA bacteremia
		    B. Promote compliance with HICPAC recommendations
		
		 Other activities or descriptions:
			July 2014
			 Ongoing

☒	☐	3. Reduce Catheter-Associated Urinary Tract Infections A. Promote bundles and education within *CAUTI: Reversing the Trend* initiative for the prevention and management of catheter-associated urinary tract infections (CAUTI)	July 2014 Ongoing
☒	☐	B. Promote adherence to evidence-based practices for the prevention of catheter-associated urinary tract infections	
☒	☐	C. Promote compliance with HICPAC recommendations for the prevention of catheter-associated urinary tract infections	
		Other activities or descriptions:	
☒	☐	4. Reduce incidence of healthcare-acquired *Clostridium difficile* A. Promotion of Antibiotic Stewardship programs that target multidrug resistant organism (MDRO) reduction in healthcare settings	July 2014 Ongoing
☒	☐	B. Promote adherence to evidence-based practices for the prevention of healthcare-acquired *Clostridium difficile* infections (e.g., hand hygiene compliance, environmental cleaning procedures, and Antibiotic Stewardship)	
		Other activities or descriptions:	
☒	☐	5. Reduce Ventilator-Associated Events A. Promote use of CDC toolkits for the care of mechanically ventilated patients (e.g., early mobility, low tidal volume ventilation, daily process measures)	July 2014 Ongoing
		Other activities or descriptions:	
☒	☐	6. Reduce Sepsis A. Promote Surviving Sepsis campaign best practice bundles	July 2014 Ongoing

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

Goal 4: Community Care Coordination

A coordinated approach with aligned clinical strategies between local and state public health, healthcare facilities, and other community partners is critical for HAI reduction, particularly due to the large amount of patient transfers that occurs in healthcare settings. Consistency and compatibility in practices and communication will allow for greater success in reaching state and national goals.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation

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		1. Community Care Coordination
		   A. Promote development of care coordination strategies within communities across the state
		   B. Promote spread of best practices and collaboration of Iowa Infection across the healthcare continuum
		   C. Enhance outbreak investigation response and reporting
		   D. Collaborate with professional licensing organizations to identify and investigate complaints related to provider infection prevention practice in non-hospital settings
		   E. Explore model protocols to improve communication between facilities relating to transfer of contagious patients between facilities (including acute care, emergency department, and long term care facilities)
		   F. Maintain HAI collaboratives with Iowa hospitals
		
		Other activities or descriptions:
			July 2014
			Ongoing

☒	☐	2. Community Engagement and HAI Response
		   A. Facilitate and promote the sharing of information across care continuums to enhance collaborative care
		   B. Develop a mapping initiative to improve coordination with local public health agencies and
			July 2015
			Ongoing

☒	☐	develop strategies to maintain current and accurate information (i.e. quarterly call down drills using HAN)	
		Other activities or descriptions:	

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		3. Assess readiness of Ebola-designated facilities within the state
		  A. Use CDC readiness assessment tool and determine gaps in infection prevention
		  B. Address gaps and develop a mitigation plan
		  C. Conduct follow-up assessments
		
		Other activities or descriptions:
			February 2015
			Ongoing

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		4. Expand infection prevention assessments
		  A. Conduct initial infection prevention assessments at all 82 critical access hospitals, 24 ambulatory surgery centers, 36 acute care hospitals, and 66 end stage renal dialysis centers in Iowa
		  B. Address gaps and develop a mitigation plan
		  C. Conduct follow-up assessments
		Other activities or descriptions:
			October 2015
			Ongoing

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		5. Increase infection prevention competency and practice in all healthcare settings through training
		  A. Host a discussion with Iowa agencies with regulatory oversight of healthcare facilities to discuss opportunities to incorporate HAI-related competencies into regulatory requirements.
		  B. 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 prevention, including the incorporation of hands on evaluations and competency assessments of best practices and a system to monitor ongoing compliance and
			October 2015
			Ongoing

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation

| | | competency | |

Goal 5: Data

Public health surveillance has been defined as the ongoing and systematic collection, analysis, and interpretation of data essential to the planning, implementation and evaluation of public health practice. Timely and accurate monitoring, validation, and reporting remain necessary to gauge progress towards HAI elimination.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation

☒ ☒ ☒ ☒ ☒ ☒ ☒	☐ ☐ ☐ ☐ ☐ ☐ ☐	1. Standardize surveillance methodologies
		   A. Utilize the National Health Safety Network (NHSN) for HAI tracking and identification of trends in data
		   B. Promote national standards for data and technology to track HAIs (e.g., NHSN, metrics, baseline measurements) for tracking and reporting
		   C. Establish a NHSN data use agreement with CDC to allow for more complete evaluation of reported data
		   D. Promote consistent definitions of infectious threats of epidemiologic importance to guide improvement efforts that align with national reporting initiatives
		   E. Encourage the use of standards-based formats (e.g., EMR) by healthcare facilities for purposes of electronic surveillance and reporting of HAI data
		   F. Develop mechanisms to protect facility/provider/patient identity when investigating incidents and potential outbreaks
		   G. Consider establishing requirements for education and training of healthcare professionals in HAI prevention to include data collection, management, and analysis
		   H. Develop tailored reports of data analyses for state or region prepared by state personnel
		
		Other activities or descriptions:
			Ongoing

☒	☐	2. Enhance detection, reporting, and target outcomes	Ongoing
		A. Target all healthcare facilities with outlier trends and provide resources to improve performance	
☒	☐	B. Enhance electronic reporting and information technology for healthcare facilities to reduce reporting burden and increase timeliness, efficiency, comprehensiveness, and reliability of the data	
☒	☐	C. Develop Iowa outcome measures in alignment with national reporting initiatives	
☒	☐	D. Enhance surveillance and detection of HAI in non-hospital settings	
☒	☐	E. Create outcome reports and conduct after-action reviews after investigations	
☒	☐	F. Build capacity to analyze HAI data to allow for comprehensive assessment of potential threats and make comparisons between healthcare facilities	
		Other activities or descriptions:	
		3. Validate data entered into HAI surveillance (e.g., through healthcare records review, parallel database comparison) to measure accuracy and reliability of HAI data collection	July 2014 Ongoing
☒	☐	A. Develop a validation plan	
☒	☐	B. Modify validation plan and methods in accordance with findings from pilot project	
☒	☐	C. Implement validation plan and methods in all healthcare facilities participating in HAI surveillance	
☒	☐	D. Analyze and report validation findings	
☒	☐	E. Use validation findings to provide operational guidance for healthcare facilities that targets any data shortcomings detected	
		Other activities or descriptions:	

Goal 6: Communication and Education

Strides are being taken to better understand how to prevent and control HAIs. Continuous communication of findings provides a basis for decision-making and action for the prevention of HAIs, while education allows for ongoing learning and improvement.

Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
☒	☐	1. Communication A. Work with appropriate infection prevention staff to review infections and evaluate prevention procedures	July 2014 Ongoing
☒	☐	B. Work with CDC to guide analytic direction and identify facilities for prioritized assessments/response	
☒	☐	C. Develop and implement an education strategy to coordinate content development among stakeholder conferences and learning communities	
☒	☐	D. Develop a searchable database listing all healthcare settings in the state and the corresponding infection prevention contact and available HAI-related data	
☒	☐	E. Maintain communication with local public health entities	
☒	☐	F. 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:	
☒	☐	2. Education A. Develop education strategies to ensure infection prevention practices become routine in healthcare facilities (e.g. hand hygiene, barrier precautions)	July 2014 Ongoing
☒	☐	B. Develop education strategies to guide offerings or activities to provide focused training on HAI surveillance, reporting and outbreak investigation.	
		Other activities or descriptions:	

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 prevention 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	CAUTI SIR	CDC NHSN	2009 for ICUs	Reduce the CAUTI SIR	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?
	1,000 urinary catheter days		Device-Associated Module	and other locations

2009 for other hospital units

(proposed 2009, in consultation with states) | by at least 25% from baseline or to zero in ICU and other locations | | |
| 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, | Reduce the admission and readmission SSI§ SIR by at least 25% from baseline or to | 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?
				in consultation with states)	zero		
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

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

[†] SSI, surgical site infection

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

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

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

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

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

[†] SSI (surgical site infection