Healthcare Associated Infections Plan
District of Columbia Department of Health
Division of Epidemiology, Disease Surveillance and Investigation
Healthcare Associated Infections Program

Background

The Government of the District of Columbia and the District of Columbia Department of Health (DCDOH) are committed to improving the quality and safety of healthcare delivered to its residents and visitors. In December 2006, the District of Columbia passed the Medical Malpractice Amendment Act of 2006. The Act, effective July 1, 2007 mandates that any licensed healthcare provider or medical facility must report adverse events to the Department of Health. Providers and facilities are required to report 29 events, which includes 28 "never" events and one type of hospital-acquired infections (HAI), central line associated bloodstream infections (CLABSI) to the Department of Health. In December 2008, the DCDOH published its first annual report on Adverse Events in the District of Columbia. This inaugural report included a description of the nature of and patterns in the adverse events reported from July 1, 2007 through June 30, 2008. In addition to providing summary data on adverse events, the report provides recommendations based on best practices relevant to adverse events that occurred during the reporting period. The analysis in the annual report and subsequent discussions with key stakeholders yielded two important findings: (1) the need to clarify definitions of reportable adverse events and standardize reporting by healthcare providers and facilities and (2) the need to continuously engage key stakeholders in efforts to identify trends and best practices that will lead to improved system level prevention strategies resulting in a decrease in healthcare associated infections. The District was in need of a comprehensive state plan that would specify efficiency and outcome measures related to HAI prevention, evaluate our progress, and improve and provide feedback to internal and external programs.

In parallel with the Medical Malpractice Amendment Act of 2006, the DCDOH also established a *MRSA (Methicillin-resistant Staphylococcus aureus) Advisory Committee* in 2007. The committee was comprised of infection control practitioners, epidemiologists, and clinicians as well as other representatives from the District of Columbia Hospital Association. The group met regularly to develop a better understanding of MRSA trends and appropriate strategies to control the spread of MRSA throughout the continuum of care. While hospitals in the District already had infection control programs in place, in accordance with DOH and CDC regulations, the *MRSA Advisory Committee* found it imperative to develop MRSA-specific guidelines for healthcare facilities in 2008. Entitled *Management of MRSA in Hospital and Non-hospital Healthcare Settings*, the policy guidelines provide scientifically-based strategies for MRSA identification, prevention, and control through reasonable screening, isolation, infection control precautions, data collection and reporting methods. Subsequently, in 2009, Chapters 2, 20, and 32 of Title 22 of the District of Columbia Municipal Regulations (DCMR) were amended to add reporting requirements and procedures for minimizing patient infection with MRSA.

In 2009, the DCDOH was awarded $250,702 for *Activity A* by the Centers for Disease Control and Prevention (CDC), American Recovery and Reinvestment Act (ARRA), Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) grant entitled *Healthcare Associated Infections-Building and Sustaining State Programs to Prevent Healthcare Associated Infections.* Using these funds, the DCDOH, in collaboration with the members of the current multidisciplinary advisory committee on infection control will continue to utilize relationships with other stakeholders and leverage resources to implement the following activities.

Plan

1. Develop or 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.

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level I			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 (LTCFs))	1/2007
	☒	☐	ii. Identify specific HAI prevention targets consistent with HHS priorities	2/2010
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☒	☐	2. Establish an HAI surveillance prevention and control program i. Designate a State HAI Prevention Coordinator	12/2009
	☒	☐	ii. Develop dedicated, trained HAI staff with at least one FTE (or contracted equivalent) to oversee the four major HAI activity areas (Integration, Collaboration, and Capacity Building; Reporting, Detection, Response and Surveillance; Prevention; Evaluation, Oversight and Communication)	8/2009
			Other activities or descriptions (not required):	
	☐	☒	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)	1/2011
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level II	☒	☐	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)	12/2009
			Other activities or descriptions (not required):	
	☐	☒	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.	1/2011
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Please also describe any additional activities, not listed above, that your state plans to undertake. Please include target dates for any new activities.				

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)

Work is ongoing to identify optimal metrics and targets for VAP infection. However, detection and measurement with existing tools and methods can be combined with recognized prevention practices in states where an opportunity exists to pursue prevention activities on that topic.

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. Please choose items to include in your plan at the planning levels desired.

[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

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level I			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	8/2010
	☒	☐	ii. Establish protocols and provide training for health department staff to investigate outbreaks, clusters or unusual cases of HAIs.	8/2010
	☐	☐	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	
	☒	☐	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)	3/2010
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☐	☒	2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues.	1/2011
			Other activities or descriptions (not required):	
Level II	☒ ☒	☐ ☐	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)	3/2010 3/2010
			Other activities or descriptions (not required):	
	☒ ☐	☐ ☒	**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)**	1/2010

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☐	☒	**iii. Catheter-associated Urinary Tract Infections (CAUTI)**	
	☒	☐	**iv. Methicillin-resistant Staphylococcus aureus (MRSA) Infections**	1/2010
	☐	☒	**v. Surgical Site Infections (SSI)**	1/2011
	☐	☒	**vi. Ventilator-associated Pneumonia (VAP)**	
			Other activities or descriptions (not required):	
	☒	☐	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).	6/2010
	☒	☐	ii. Establish baseline measurements for prevention targets	9/2010
			Other activities or descriptions (not required):	
	☒	☐	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	2/2010
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☒	☐	7. Develop tailored reports of data analyses for state or region prepared by state personnel	1/2011
			Other activities or descriptions (not required):	
Level III	☐	☐	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 (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☐	☒	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	9/2010
			Other activities or descriptions (not required):	
	☒	☐	10. Collaborate with professional licensing organizations to identify and investigate complaints related to provider infection control practice in non-hospital settings, and to set standards for continuing education and training	6/2010
			Other activities or descriptions (not required):	
	☐	☐	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	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☐	☐	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.	
			Other activities or descriptions (not required):	
	☐	☒	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	1/2011
			Other activities or descriptions (not required):	
	☒	☐	13. Make available risk-adjusted HAI data that enables state agencies to make comparisons between hospitals.	9/2010
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☒	☐	14. Enhance surveillance and detection of HAIs in nonhospital settings	6/2010
			Other activities or descriptions (not required):	
Please also describe any additional activities, not listed above, that your state plans to undertake. Please include target dates for any new activities.				

3. Prevention

State implementation of HHS Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations is a critical step towards the elimination of HAIs. CDC with HICPAC has 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 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

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level I	☒	☐	1. Implement HICPAC recommendations. i. Develop strategies for implementation of HICPAC recommendations for at least 2 prevention targets specified by the state multidisciplinary group.	2010 ongoing
			Other activities or descriptions (not required):	
	☐	☐	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 (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
	☒ ☒ ☒	☐ ☐ ☐	3. Establish HAI collaboratives with at least 10 hospitals (i.e. this may require a multi-state or regional collaborative in low population density regions) i. Identify staff trained in project coordination, infection control, and collaborative coordination ii. Develop a communication strategy to facilitate peer-to-peer learning and sharing of best practices iii. Establish and adhere to feedback of a clear and standardized outcome data to track progress	2010 ongoing
			Other activities or descriptions (not required):	
	☒	☐	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	2010 ongoing
			Other activities or descriptions (not required):	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level II			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, enhancing surveyor training and tools, and adding sources and uses of infection control data	
	☐	☐	iv. Consider expanding regulation and oversight activities to currently unregulated settings where healthcare is delivered or work with healthcare partners to establish best practices to ensure adherence	
			Other activities or descriptions (not required):	
	☐	☐	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)	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
			Other activities or descriptions (not required):	
	☒	☐	7. Establish collaborative to prevent HAIs in nonhospital settings (e.g., long term care, dialysis)	9/2010
			Other activities or descriptions (not required):	
Please also describe any additional activities, not listed above, that your state plans to undertake. Please include target dates for any new activities.				

4. Evaluation and Communications

Program evaluation is an essential organizational practice in public health. Continuous evaluation and communication of practice 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 to occur. 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

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
Level I	☐ ☐	☒ ☐	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 towards targets and ii. Establish systems for refining approaches based on data gathered	2011
			Other activities or descriptions (not required):	
	☒	☐	2. Develop and implement a communication plan about the state's HAI program and 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	2010 ongoing

			Other activities or descriptions (not required):	
Level II	☐	☐	3. Provide consumers access to useful healthcare quality measures	
			Other activities or descriptions (not required):	
Level III	☐	☐	4. Identify priorities and provide input to partners to help guide patient safety initiatives and research aimed at reducing HAIs	
			Other activities or descriptions (not required):	
Please also describe any additional activities, not listed above, that your state plans to undertake. Please include target dates for any new activities.				

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.

To address concerns regarding validity, HHS is providing funding, utilizing Recovery Act of 2009 funds, to CDC to support states in validating NHSN-related measures and to support reporting on HHS metrics through NHSN. Also, most of the reporting metrics outlined here have already

been endorsed by NQF and for population-based national measures on MRSA and *C. difficile*, work to develop hospital level measures will be conducted in the next year utilizing HHS support to CDC through funds available in the Recovery Act.

Finally, to address concerns regarding flexibility in accommodating new measures, reviewing progress on current measures, and incorporating new sources of measure data (e.g., electronic data, administrative data) or new measures, HHS and its constituent agencies will commit to an annual review and update of the HHS Action Plan Targets and Metrics.

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

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?
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[*]
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

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

† SSI, surgical site infection

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

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

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

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

	Observed HAIs			**Expected HAIs**		
HAI Metric	**#CLABSI**	**#SSI†**	**#Combined HAI**	**#CLABSI**	**#SSI†**	**#Combined HAI**
CLABSI 1	228			287		
SSI 1		636			853.8	
Combined HAI			228 + 636 = 864			287+853.8 = 1140.8

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

† SSI, surgical site infection