Virginia Department of Health

Plan for Healthcare-Associated Infections (HAIs)

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VDH VIRGINIA DEPARTMENT OF HEALTH

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Executive Summary

The overarching goal of Virginia's *Plan for Healthcare-Associated Infections* (HAI) is to provide a framework for preventing healthcare-associated infections in the Commonwealth. Virginia seeks to serve as a national leader in HAI prevention efforts, demonstrating top tier performance in the reduction of HAI rates. The Plan provides HAI prevention strategies from the state perspective. However, it is noted that changes at the institutional level, within healthcare facilities across the state, are needed to reduce the occurrence of HAIs.

Public health involvement in HAI prevention increased in 2005 in Virginia, with the passage of a related bill in the Virginia General Assembly. The bill required acute care hospitals in the Commonwealth to report HAIs to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN). Reporting regulations specified the reporting of central-line associated bloodstream infections (CLABSI) in adult intensive care units. The law went into effect July 1, 2008. Additional HAI reporting measures are currently being proposed through the Virginia regulatory process.

Virginia's *Plan for Healthcare-Associated Infections* (HAI) addresses four target areas: (1) Developing and Enhancing HAI Program Infrastructure; (2) Surveillance, Detection, Reporting and Response; (3) Prevention; and (4) Evaluation and Communications. The Plan is consistent with the U.S. Department of Health and Human Services (HHS) Action Plan for HAI and was developed using the HHS template for states. Three planning levels are identified for each of the goals in the Plan, reflecting basic (level 1), intermediate (level 2) and mature (level 3) prevention efforts. Activities are identified as "Underway" (presently engaged in using currently available resources) or "Items Planned" (future directions, contingent on available resources and competing priorities). HAI activities funded through the American Recovery and Reinvestment Act of 2009 (ARRA) are reflected in the Plan. Virginia will seek to identify additional funding sources to bolster HAI efforts in the state and to ensure the sustainability of initiatives after December 31, 2011, when ARRA grant funding is expected to cease.

The first target area addressed in the Plan is *Developing and Enhancing HAI Program Infrastructure*. Activities in this area include: supporting and expanding the HAI Advisory Group, which provides oversight and feedback into HAI initiatives; increasing coordination of HAI efforts between organizations; supporting a state HAI program coordinator and other HAI staff; and integrating laboratory activities with HAI efforts. If additional funds become available, Virginia will increase efforts to facilitate the use of standards-based formats by healthcare facilities for the reporting of HAI data.

The second target area addressed in the plan is *Surveillance, Reporting, Detection, and Response.* Activities in this area include: Improving outbreak detection, investigation, and communication; identifying HHS prevention targets for surveillance; implementing HAI pilot surveillance projects; adopting national standards to track HAIs; developing standardized data reports; providing HAI-related training; and validating CLABSI data currently reported to NHSN. If additional funds become available, Virginia will work to enhance electronic reporting of HAI data, adopt integration and interoperability standards for HAI information systems and data sources, and improve surveillance/detection of HAIs in non-hospital settings.

The third target area addressed in the Plan is *Prevention*. Activities in this area include: implementing HAI collaboratives targeting Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations; establishing a workgroup to oversee the collaboratives; and developing a HAI training program for healthcare professionals. Collaborative prevention efforts will occur in acute care and long-term care settings. If supplemental funds become available, Virginia plans to address compliance with adherence to HICPAC recommendations and expand collaboratives to target additional clinical settings.

The fourth target area addresses *Evaluation and Communications.* Activities in this area include: developing training programs to address identified needs; developing a HAI communication plan; and continuing to provide consumer access to HAI information, including data. If additional funds become available, Virginia will seek to increase involvement in patient safety initiatives and identify opportunities for additional HAI research.

The Virginia Department of Health is working closely with its partners and an Advisory Group, made up of representatives from demographically diverse hospitals and key stakeholders, to implement Virginia's *Plan for Healthcare-Associated Infections.* The Plan will be revised regularly to reflect updated policies and practices.

I. Goal of HAI Prevention

The overarching goal of Virginia's Plan for Healthcare-Associated Infections (HAI) is to provide a framework for preventing healthcare-associated infections in the Commonwealth. Virginia seeks to serve as a national leader in HAI prevention efforts, demonstrating top tier performance in the reduction of HAI rates.

The Plan provides strategies to reduce HAIs from the state perspective. However, it is noted that healthcare facilities across the state bear the primary responsibility for infection reduction and that changes at the institutional level are needed to reduce the occurrence of HAIs.

II. Background

In response to increasing concerns about the public health impact of healthcare-associated infections (HAIs), the U.S. Department of Health and Human Services (HHS) developed an Action Plan to Prevent Healthcare-Associated Infections (HHS Action Plan). The HHS Action Plan includes recommendations for surveillance, research, communication, and metrics for measuring progress toward national goals. Three overarching priorities include: progress toward 5-year national prevention targets; improving use and quality of the metrics and supporting systems needed to assess progress toward meeting the targets; and prioritization and broad implementation of current evidence-based prevention recommendations.

Virginia has used the HHS Action Plan as a template for the Virginia HAI Plan and to guide HAI efforts in the state. Virginia recognizes the challenge of identifying, responding to, and preventing HAIs across the continuum of settings where healthcare is currently delivered. The public health model's population-based perspective 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. At the same time, trends toward mandatory reporting of HAIs from hospitals reflect increased demand for accountability from the public.

The Virginia HAI Plan targets the following areas:

1. Developing/Enhancing HAI Program Infrastructure;
2. Surveillance, Detection, Reporting, and Response;
3. Prevention; and
4. Evaluation, Oversight, and Communication.

III. Framework and Funding for Prevention of HAIs

In 2005, a bill passed in the Virginia General Assembly requiring acute care hospitals in the Commonwealth to report healthcare-associated infections to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN). The bill specified that the State Board of Health define the reportable infections and populations to be monitored. The Board passed regulations requiring the reporting of central line-associated bloodstream infections (CLABSI) in adult intensive care units to NHSN. The law went into effect July 1, 2008. The first reporting period covered July through December 2008 and reporting has occurred on a quarterly basis thereafter. VDH staff review the NHSN data quarterly and create a report

identifying CLABSI by hospital; the report is available to stakeholders and the public through the VDH website [http://www.vdh.virginia.gov/Epidemiology/Surveillance/HAI/haireport.htm].

While no state funding accompanied the HAI reporting requirement, support for HAI prevention in Virginia has recently been enhanced through the American Recovery and Reinvestment Act (ARRA). Virginia received over $1 million in September 2009 to support state efforts to prevent HAIs through December 2011. VDH has partnered with a number of organizations to implement the grant objectives, which include: (1) Enhancing state health department capacity for HAI prevention efforts; (2) Developing a state plan for the surveillance and prevention of HAIs in Virginia; (3) Developing training programs to enhance capacity for HAI surveillance and prevention; (4) Validating HAI data currently reported by hospitals; (5) Supporting pilot projects involving additional reporting of HAI data to evaluate the costs and benefits of the expanded reporting; and (6) Implementing HAI prevention collaboratives targeting acute care and long-term care facilities. VDH has partnered with a number of agencies to implement grant objectives, including: the Association for Professionals in Infection Control and Epidemiology, Inc, Virginia Chapter (APIC-VA), the Virginia Hospital and Healthcare Association (VHHA), VHQC (Virginia's Quality Improvement Organization), Virginia Health Care Association (VHCA), Virginia Association for Nonprofit Homes for the Aging (VANHA), Virginians Improving Patient Care and Safety (VIPC&S), and Virginia Assisted Living Association (VALA).

Ongoing federal resources are vital to ensuring the success and sustainability of HAI efforts in Virginia. Currently, the availability of federal funding to address HAIs after December 2011 is uncertain. Virginia will seek to identify additional opportunities for funding, through federal, state, and private resources, to ensure the sustainability of efforts after December 2011 and to increase and expand HAI prevention efforts across the state.

VDH and its partners are working closely with an Advisory Group to implement grant objectives and oversee HAI efforts in Virginia. The HAI Advisory Group includes representation from demographically diverse hospitals and key stakeholders and was formed in early 2008. The group met three times in 2008 and has started meeting quarterly to provide input and feedback on HAI-related activities in the Commonwealth.

Since the Virginia HAI reporting regulations went into effect in July 2008, there has been increasing interest from various groups in expanding the current reporting requirements to include additional HAI measures. Proposed additional measures were presented to the Virginia Board of Health in April 2010 and include: adding the requirement for hospitals to report central line-associated bloodstream infections (CLABSI) outside ICU (1 adult medical and 1 adult surgical ward), adding *Clostridium difficile* infections (lab event in NHSN), and obtaining data from Surgical Care Improvement Project (SCIP) reports quarterly. The next step in the regulatory process will be to publish the proposed revised regulations in the *Virginia Register of Regulations* for public comment.

IV. Developing and Enhancing 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.

Table 1: State Infrastructure Planning for HAI Surveillance, Prevention, and Control

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
Level I			1. Establish statewide HAI prevention leadership through the formation of multidisciplinary group or state HAI advisory council	
	i. ☒		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))	Ongoing; The HAI Advisory Group has been meeting since early 2008 and meets quarterly to address HAI prevention efforts. The HAI Advisory Group contains diverse membership, including: the state hospital and healthcare association, APIC-VA, academic organizations, consumer groups, Board of Health representation, the state Quality Improvement Organization, and hospital administrators. In 2010 and 2011, VDH will work with VHHA to expand Advisory Group membership and partners.

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
		ii. ☒	ii. Identify specific HAI prevention targets consistent with HHS priorities	VDH will implement two prevention collaboratives in 2010 and 2011 that are consistent with HHS priority targets. One collaborative will target acute care facilities and will focus on Surgical Site Infections (SSI). The second collaborative will target long-term care facilities and will focus on *C. difficile* infections (CDI).
	Other activities or descriptions: VDH has partnered with a number of agencies to address HAI prevention in Virginia, including: the Association for Professionals in Infection Control and Epidemiology, Inc, Virginia Chapter (APIC-VA), the Virginia Hospital and Healthcare Association (VHHA), VHQC (Virginia's Quality Improvement Organization), Virginia Health Care Association (VHCA), Virginia Association for Nonprofit Homes for the Aging (VANHA), Virginians Improving Patient Care and Safety (VIPC&S), and Virginia Assisted Living Association (VALA). VDH and its partners are also working with an HAI Advisory Group, which provides oversight and guidance to HAI efforts implemented in Virginia.			
	i. ☒ ii. ☒		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 the four major HAI activity areas (Integration, Collaboration, and Capacity	VDH has an HAI program located within the Division of Surveillance and Investigation (DSI). The HAI program team includes several dedicated staff. A VDH HAI Coordinator position was established and filled as a 30 hour/week

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
			Building; Reporting, Detection, Response and Surveillance; Prevention; Evaluation, Oversight and Communication)	position. The position has recently been converted into a full-time position. A full-time HAI epidemiologist was hired in November 2009; a CSTE HAI epidemiologist position was filled as of October 2009. The two epidemiology positions coordinate the surveillance and evaluation portions of the grant and report to the VDH HAI Coordinator, who oversees the four major HAI activity areas. VDH is also working to establish a 30 hour/week HAI Health Educator position, which will assist with educational outreach to a wide variety of audiences. The DSI Director, the State Epidemiologist, and the HAI Advisory Committee provide oversight and guidance to the VDH HAI program.
		i. ☒	3. Integrate laboratory activities with HAI surveillance, prevention and control efforts. i. Improve laboratory capacity to confirm	Ongoing; HL7 messaging was not supported through ARRA grant funds. VDH

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
			emerging resistance in HAI pathogens and perform typing where appropriate (e.g., outbreak investigation support, HL7 messaging of laboratory results)	will seek funding through other sources to support HL7 messaging of laboratory results from hospitals to the Virginia NEDSS system (our electronic disease surveillance system) and ultimately to NHSN. VDH currently partners with the Virginia Division of Consolidated Laboratory Services to perform molecular typing of pathogens during the investigation of HAI outbreaks.
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)	Ongoing; VDH Division of Surveillance and Investigation (general communicable disease control) is coordinating HAI efforts for VDH. VDH is working closely with partners and the statewide HAI Advisory Group to implement HAI grant objectives. In 2010, membership will be expanded to include

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				representation from local health departments, the VDH Office of Licensure and Certification, and the Virginia Department of Health Professions, which licenses healthcare providers.
			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.	Virginia plans to use ARRA funds to support an information technology (IT) specialist to assist hospitals participating in the SSI surveillance pilot project. The IT specialist will work with facilities and their software vendors to determine how to upload SSI event and surgical procedure denominator data into NHSN. VDH will continue to seek additional sources of funding to support electronic reporting and enhancement of information technology capacity.
Additional Activities: • A steering group for the ARRA grant has been established and includes representation from VDH, VHHA, VHQC, APIC-VA,				

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
and VHCA. The steering group meets monthly to assess progress and provide guidance to the implementation of grant objectives.				

V. Surveillance, Detection, Reporting, and Response

Timely and accurate monitoring remains necessary to gauge progress toward 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), improvements to simplify and enhance data collection, and improved dissemination of results to healthcare providers and the public are essential steps toward increasing HAI prevention capacity in Virginia.

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

[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		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	Ongoing; VDH requires the reporting of all outbreaks (including HAI) to local health departments by the most rapid means available. Local health department (LHD) staff work with infection preventionists and other healthcare providers to increase knowledge about the reporting requirement and improve outbreak reporting; LHD staff regularly attend hospital infection control committee meetings to improve communication around HAIs and other reportable disease issues.
	☒		ii. Establish protocols and provide training for health department staff to investigate outbreaks, clusters or unusual cases of HAIs.	LHD staff have received information on HAI reporting in Virginia at annual trainings. An overview of the Virginia HAI program was presented on a statewide conference call in February 2010. In July 2010, an in-person training with local health department staff will take place; training will be provided by the VDH HAI

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				team addressing the investigation of HAI outbreaks. By December 2010, Virginia Disease Control Manual Chapters will be developed for LHD communicable disease staff addressing the prevention and control of outbreaks at hospitals and nursing care facilities; policies and procedures for the investigation of outbreaks will be included in the chapters. Additional chapters have already been developed and posted for local health department staff that address pathogens often associated with HAI outbreaks (e.g., *Acinetobacter, C. difficile*).
	☒		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	VDH has an agency wide administrative policy in place that protects facility identity; Section 32.1-41 of the *Virginia Code* specifies that the anonymity of patients and practitioners is protected.
		☒	iv. Improve overall use of surveillance data to identify and prevent HAI outbreaks or	By December 2010, the HAI Epidemiologist will develop a

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
			transmission in HC settings (e.g., hepatitis B, hepatitis C, multi-drug resistant organisms (MDRO), and other reportable HAIs)	plan to regularly review surveillance data to identify possible clusters of HAI.
	☒		2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues.	Ongoing; the Virginia state public health laboratory, the Division of Consolidated Laboratory Services (DCLS) partners with VDH to provide testing in support of HAI outbreaks. DCLS has provided laboratory support for testing for recent HAI outbreaks due to influenza, norovirus, *Staphylococcus aureus* and hepatitis. VDH will continue to partner with DCLS on an ongoing basis to provide testing and/or coordinate testing at CDC for HAI outbreaks that are reported.
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	Ongoing; the *Regulations for Disease Reporting and Control* in Virginia require the rapid reporting of outbreaks (including healthcare-associated outbreaks) to local health departments, which then

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				report to the state health department. Additional details about reporting HAI-related outbreaks will be included in the Virginia Disease Control Manual Chapters that will be produced by December 2010.
	☒		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)	In the past, VDH had a system in place that automatically shared outbreak information between the Division of Surveillance and Investigation (responsible for investigating most HAI outbreaks) and the VDH Office of Licensure and Certification. By December 2010, VDH will work to ensure that the system is re-instituted and that data on HAI-related outbreaks are exchanged securely.
	☒	☒ ☒	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) *Clostridium difficile* Infections (CDI) iii. Catheter-associated Urinary Tract Infections (CAUTI) Methicillin-resistant Staphylococcus aureus (MRSA) Infections	VDH currently monitors CLABSI in adult intensive care units through mandatory reporting to NHSN. Additional HAI reporting requirements are currently being proposed through the Virginia regulatory process and include: adding the
		ii. iv.		

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				requirement for hospitals to report central line-associated bloodstream infections (CLABSI) outside ICU (1 adult medical and 1 adult surgical ward), adding *Clostridium difficile* infections (lab event in NHSN), and obtaining data from Surgical Care Improvement Project (SCIP) reports quarterly. In addition to changing the reporting regulations, VDH is also implementing pilot projects testing the reporting of other HAI surveillance metrics. Eighteen hospitals, sampled based on bed-size category, have agreed to participate in a pilot project starting 7/1/2010 and continuing for 1 year, monitoring HAI for specific SSIs (infections following coronary artery bypass graft surgery, hip arthroplasty, or knee arthroplasty.) A pilot project involving

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
		☒	Surgical Site Infections (SSI) vi. Ventilator-associated Pneumonia (VAP)	laboratory reporting of *C. difficile* using the NHSN laboratory module will involve 10 hospitals pilot testing data entry and will begin in Fall 2010.
	Other activities or descriptions:			
		v.	5. Adopt national standards for data and technology to track HAIs (e.g., NHSN).	Virginia currently uses NHSN for reporting of CLABSI in adult ICUs. Virginia is pilot testing additional reporting metrics (SSI and *C. difficile*). NHSN will be used for the pilot tests. Virginia's prevention collaboratives will address SSI and *C. difficile*, both of which are HHS prevention targets. By December 2010, VDH will review the first two years of CLABSI data entered into NHSN to establish baseline measurements; trends will be identified and a report will be produced for the VDH HAI Team and the HAI Advisory
		☒	i. Develop metrics to measure progress towards national goals (align with targeted state goals). (See Appendix 1).	
		☒	ii. Establish baseline measurements for prevention targets	

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				Group. By 2011, VDH epidemiologists will incorporate the use of standardized infection ratios (SIR) into quarterly reports presenting Virginia CLABSI data.
	☒		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	VDH has partnered with APIC-VA to provide training to hospitals on NHSN enrollment, data collection, and data management for CLABSI reporting. VDH staff have worked with hospitals that have had difficulties with the enrollment process and conferring rights to view the data to VDH. In June 2010, APIC-VA and VDH will be conducting a training on monitoring SSIs in NHSN for the 18 hospitals participating in the SSI surveillance pilot. A training team is currently developing plans to provide additional training for hospital staff in 2010 and 2011 based on the results of a needs assessment, which was conducted in late Winter 2010.

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
	☒		7. Develop tailored reports of data analyses for state or region prepared by state personnel	CLABSI data by hospital are currently produced quarterly and posted to the VDH website. By December 2010, VDH epidemiologists will develop additional automated queries of data entered into NHSN for use by project partners and stakeholders. By January 2011, VDH will review the first two years of CLABSI data entered into NHSN; trends will be identified and a report will be produced for the VDH HAI Team and the HAI Advisory Group.
Level III		☒ 8. ☒ ☒ ☒ ☒ i. ii. iii. iv.	Validate data entered into HAI surveillance (e.g., through healthcare records review, parallel database comparison) to measure accuracy and reliability of HAI data collection Develop a validation plan Pilot test validation methods in a sample of healthcare facilities Modify validation plan and methods in accordance with findings from pilot project Implement validation plan and methods in all healthcare facilities participating in HAI surveillance	VDH will partner with VHHA to validate CLABSI data entered into NHSN. The methodology for the validation project will be written by Summer 2010; implementation will begin in Winter 2010. The validation process will involve: identifying positive blood cultures for a designated time period at facilities; conducting chart reviews; and determining if the bloodstream

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
		☒ ☒ v. vi.	Analyze and report validation findings Use validation findings to provide operational guidance for healthcare facilities that targets any data shortcomings detected	infections were central line-associated. Data will be compared to what has been entered into NHSN. Validation study findings will be compiled into a written report and used to provide operational guidance for facilities where shortcomings were detected. Training sessions for healthcare facilities will target areas of concern.
		☒	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	Processes and response steps for responding to suspected HAI clusters/outbreaks will be outlined in HAI Virginia Disease Control Manual Chapters that will be developed by December 2010. The chapters will be available to local, state, and regional communicable disease staff to assist with response efforts. The need for additional guidance and the development of tiered response criteria will be assessed and implemented in 2012 and 2013, pending the continued support of HAI staff

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				with relevant expertise to develop the guidelines.
		☒	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	Virginia will plan for implementation in 2012 and 2013, pending the identification of additional funding sources. The VDH Office of Licensure and Certification currently investigates complaints about the quality of care provided in Virginia healthcare facilities.
			11. Adopt integration and interoperability standards for HAI information systems and data sources	Virginia will plan for implementation in 2012 and 2013, pending the identification of additional funding 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.	
		☒	12. Enhance electronic reporting and information technology for healthcare facilities to reduce reporting burden and increase timeliness, efficiency, comprehensiveness, and reliability of the data	Virginia did not receive ARRA grant funding to support HL7 messaging of HAIs from hospitals to Virginia NEDSS (our electronic disease

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
	☒		i. Report HAI data to the public	surveillance system) and to NHSN. However, funds are planned to be used to support an information technology (IT) specialist to assist hospitals participating in the SSI surveillance pilot project. The IT specialist will work with facilities and their software vendors to determine how to upload SSI event and surgical procedure denominator data into NHSN, thereby reducing the reporting burden and increasing efficiency. VDH will continue to seek additional funding sources to implement electronic reporting of HAI related data. VDH currently produces quarterly reports of CLABSI data reported to NHSN from Virginia hospitals. As new reporting regulations are finalized and additional HAI data are reported to VDH, the data will be made available to the public through the VDH HAI website and other sources.
		☒	13. Make available risk-adjusted HAI data that enables state	By 2011, VDH staff will

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
			agencies to make comparisons between hospitals.	incorporate the use of standardized infection ratios (SIR) into quarterly reports presenting Virginia CLABSI data. Following the amendment of the Virginia *Regulations for Disease Reporting and Control* to include additional reporting measures (likely in 2012), VDH will identify risk-adjustment strategies for the additional reporting measures.
	☒		14. Enhance surveillance and detection of HAIs in nonhospital settings	Ongoing; nursing homes are required by the Virginia *Regulations for Disease Reporting and Control* to rapidly report all outbreaks to local health departments, which report to the state health department. Local health department staff routinely work with nursing home staff to improve communication about reportable diseases and outbreaks. In 2010-2011, Virginia will focus one of its prevention collaboratives on long-term care facilities. Enhanced surveillance for *C.*

Planning Level	Check Items Underway	Check Items Planned		Target Dates for Implementation
				difficile infection will be conducted; prevention educational efforts will be implemented targeting hand hygiene compliance and implementation of contact precautions. Educational resources on infection prevention and surveillance will be developed and shared with assisted living facilities and nursing homes via toolkits and trainings.

VI. Prevention

State implementation of HHS Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations is a critical step toward 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 for the Centers for Medicare and Medicaid Services (CMS) Surgical Care Improvement Project (SCIP). 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.

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.	The HAI collaboratives implemented in Virginia in 2010 and 2011 will address two HHS prevention targets. Virginia will implement one prevention collaborative targeting SSI in acute care facilities. The second prevention collaborative will target *C. difficile* infection in long-term care facilities. The prevention collaboratives will be implemented by the VDH HAI team and VDH partners and will be overseen by the HAI

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				Advisory Group and its Prevention Workgroup.
	☒		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	At a 2010 meeting of the HAI Advisory Group, a Prevention Workgroup will be formed to guide the two prevention collaboratives. The Workgroup will include two focus areas: one will target acute care facilities and the other will target long-term care facilities. The Workgroup will include experts who will be available to provide guidance and oversight to the prevention collaboratives, including providing consultation and advice to facilities involved in the prevention collaboratives and assessing effectiveness and timeliness of the initiatives. The collaboratives will be launched in 2010 and will be completed by

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				December 2011.
			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)	A prevention collaborative targeting SSI in acute care facilities will be implemented in Virginia, and will be coordinated by the VDH HAI team and project partners. The prevention collaborative will be conducted with the 18 hospitals implementing enhanced surveillance for SSI (specifically using NHSN for SSIs following coronary artery bypass graft, hip replacement, or knee replacement surgery). The project will involve providing outcome and SCIP process measure data, coupled with prevention messages, to the applicable clinical unit(s) and assessing the impact of data feedback on compliance with prevention
	☒		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	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				recommendations. A second collaborative focusing on *C. difficile* infection will be implemented with long-term care facilities. VHCA will serve as a leader on the initiative. Enhanced CDI surveillance will be implemented; infection targets will be linked to educational activities targeting hand hygiene compliance and implementation of contact precautions. Regular teleconferences and one-on-one technical assistance will be used as communication strategies. A meeting will be held in 2011 to share successes and identify accomplishments from the collaboratives. VDH will coordinate production of a report by December 2011 summarizing the

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				collaborative activities and results.
			Other activities or descriptions (not required): Through its Patient Safety Learning Network, VHQC is supporting 10 Virginia hospitals in MRSA reduction efforts. Each hospital has chosen a pilot unit in which to implement interventions that include: (1) Surveillance of high-risk areas and/or high-risk patients; (2) Consistent, thorough hand washing at the point of care; (3) Contact precautions for all MRSA-colonized or infected patients; and (4) Revised protocols for environmental cleaning and disinfection. VHQC also is assisting 16 hospitals that are participating in the CMS Surgical Care Improvement Project (SCIP). These facilities are implementing infection prevention strategies that include: (1) Proper timing of pre-surgical prophylactic antibiotic administration; (2) Selection of antibiotics specific to the surgical procedure or site; (3) Timely post-surgical discontinuation of prophylactic antibiotics; and (4) Pre-surgical hair removal with clippers instead of razors.	Both the MRSA and SCIP initiatives began August 1, 2008, and will be completed by July 31, 2011.
		☒ i.	4. Develop state HAI prevention training competencies 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	A team has been assembled to develop a HAI training plan for Virginia, based on feedback from a needs assessment that was conducted in early 2010. By July 2010, the work group will complete development of a training plan. By Spring 2011, at least one training session

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				will be completed. An additional training session will be completed by November 2011. Identification of best practices for training and certification will take place in 2012 and 2013, pending the identification of additional HAI funding sources. Based on results of a needs assessment planned for 2010, trainings for long-term care facilities (assisted living facilities and nursing homes) will be developed and implemented in late 2010 and 2011.
Level II			5. Implement strategies for compliance to promote adherence to HICPAC recommendations	VDH will consider these activities in 2012 and 2013 and will factor in lessons learned through the ARRA-funded activities implemented during 2010 and 2011.
		☒	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	

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
			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	
		☒ 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)	In 2012, after assessment of the prevention collaboratives implemented through the ARRA HAI grant and pending the identification of additional funding, the Virginia HAI Advisory Group will assess the feasibility of expanding the collaborative initiative to additional hospitals.
		☒	7. Establish collaborative to prevent HAIs in nonhospital settings (e.g., long term care, dialysis)	One of the prevention collaboratives implemented in Virginia will target *C. difficile* in long-term care facilities. Participating facilities will conduct surveillance

Planning Level	Check Items Underway	Check Items Planned	Items Planned for Implementation (or currently underway)	Target Dates for Implementation
				for these infections and will work together to identify ways to improve compliance with infection prevention recommendations. Participants will also share best practices and evaluate the use of information materials in influencing staff behavior. After evaluation of the collaborative in late 2011 and pending additional funding, the collaborative will be expanded in 2012 and 2013.

VII. 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.

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 ii. Establish systems for refining approaches based on data gathered	The VDH HAI Team designed and administered a needs assessment to hospital infection preventionists, quality improvement staff, and hospital administrators in early 2010. Training programs to address the needs identified will be developed in the summer of 2010 . Training will be implemented in 2010 and 2011. An evaluation component will be built into each HAI activity area and each training session held in 2010 and 2011. Assisted living facilities and nursing

				homes will also be surveyed regarding their needs for training related to infection prevention, surveillance, and control.
		☒ i.	2. Develop and implement a communication plan about the state's HAI program and progress to meet public and private stakeholders needs Disseminate state priorities for HAI prevention to healthcare organizations, professional provider organizations, governmental agencies, non-profit public health organizations, and the public	Throughout 2010, the VDH HAI Coordinator will work with the VDH HAI team and the Advisory Group to develop an HAI communication plan. Throughout 2010 and 2011, VDH will work with the HAI Advisory Group and partner organizations to increase awareness about Virginia priorities for HAI prevention, reporting requirements in Virginia, pilot initiatives, and collaboratives. VDH will continue to provide HAI information for the public through its website, and in 2010, VDH will begin development of an HAI Resource Library, which will include a component addressing HAI Best Practices. The HAI

				Coordinator will continue to develop and disseminate an HAI newsletter for infection preventionists and health department staff addressing HAI.
Level II	☒		3. Provide consumers access to useful healthcare quality measures	Ongoing; VDH currently has an HAI website that addresses reporting requirements, data, and prevention information. As additional reporting requirements are added in Virginia, data and educational materials about each measure, including how to prevent the reported outcomes, will be made available on the website. Special consideration will be taken when describing data on the website to ensure that the general public can easily interpret relevant HAI process and outcome measures. ARRA funds will be used to add enhancements to the HAI web site. In 2010 and 2011, VDH

				also will develop an HAI Resource Library for healthcare personnel, which will include toolkits, fact sheets, data reporting templates, identification of Best Practices, and other educational materials.
Level III		☒ 4.	Identify priorities and provide input to partners to help guide patient safety initiatives and research aimed at reducing HAIs	Through the ARRA grant, Virginia will be implementing pilot projects targeting SSI and C. difficile infection. The goal of the pilot projects is to evaluate the time, effort, expense, and benefits of reporting additional HAI measures. Virginia will use lessons learned from implementation of the pilot projects in 2010 and 2011 to identify future HAI surveillance and prevention initiatives.

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.

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

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

95%CI = (0.628,0.989)

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

In the table above, there are two strata to illustrate risk-adjustment by location type for which national data exist from NHSN. The SIR calculation is based on dividing the total number of observed CLABSI events by an "expected" number using the CLABSI rates from the standard population. This "expected" number is calculated by multiplying the national CLABSI rate from the standard population by the observed number of central line-days for each stratum which can also be understood as a prediction or projection. If the observed data represented a follow-up period such as 2009 one would state that an SIR of 0.79 implies that there was a 21% reduction in CLABSIs overall for the nation, region or facility.

The SIR concept and calculation is completely based on the underlying CLABSI rate data that exist across a potentially large group of strata. Thus, the SIR provides a single metric for performing comparisons rather than attempting to perform multiple comparisons across many strata which makes the task

cumbersome. Given the underlying CLABSI rate data, one retains the option to perform comparisons within a particular set of strata where observed rates may differ significantly from the standard populations. These types of more detailed comparisons could be very useful and necessary for identifying areas for more focused prevention efforts.

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

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

Risk Group Stratifiers		**Observed SSI Rates**			**NHSN SSI Rates for 2008 (Standard Population)**		
Procedure Code	**Risk Index Category**	**#SSI†**	**#procedures**	**SSI rate***	**#SSI†**	**#procedures**	**SSI rate***
CBGB	1	315	12,600	2.5	2100	70,000	3.0
CBGB	2,3	210	7000	3.0	1000	20,000	5.0
HPRO	1	111	7400	1.5	1020	60,000	1.7

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

95%CI = (0.649,0.851)

† SSI, surgical site infection

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

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

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

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

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

$$SIR = \frac{observed}{expected} = \frac{228+636}{287+853.8} = \frac{864}{1140.8} = 0.76$$

95%CI = (0.673,0.849)

† SSI, surgical site infection