Executive Summary

The National Healthcare Safety Network (NHSN) is a secure, internet-based surveillance system managed and maintained by the Centers for Disease Control and Prevention (CDC). As the leading national surveillance system for healthcare-associated infections (HAIs), NHSN now serves more than 15,000 medical facilities tracking HAIs and other patient safety indicators, including bloodstream infections, surgical site infections, and healthcare personnel influenza vaccination rates, among others. Current participants reporting data to NHSN include acute care hospitals, long-term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and nursing homes, with hospitals and dialysis facilities representing the majority of facilities reporting data. The data submitted by those healthcare facilities are used to improve patient safety at the local, state, and national levels. The CDC analyzes and publishes the surveillance data to estimate and characterize the national burden of HAIs. At the local and state level, participating facility and group users (such as state health departments) can access the data to generate reports and graphs that compare facility-level or state-level HAI metrics to national aggregate data. These reports and graphs may be published online on a website or made available to the public via an interactive web portal or hospital report card.

Currently, multiple organizations and stakeholder groups publish NHSN data using various methods, time periods, and presentation strategies. These differences in data analysis and presentation techniques can lead to conflicting results and consumer confusion regarding the HAI experience in an individual facility. Although individual states may have legislative or regulatory stipulations on how HAI data are to be displayed and shared, development of a standardized approach to data presentation can fill a gap in the current practice of HAI public reporting. As participation in NHSN increases and the availability of HAI data extends to a variety of governmental and non-governmental organizations, it is imperative to outline some distinct parameters for appropriate analysis and presentation of HAI data.

To that end, in June 2013, the Council of State and Territorial Epidemiologists (CSTE) passed a policy position statement (13-ID-02) that called for the establishment of a multidisciplinary workgroup chaired by CSTE and CDC to develop a toolkit of best practices and recommended methods of presenting and analyzing HAI measures.

The HAI Data Analysis and Presentation Standardization toolkit was developed as a result of the workgroup’s activities and is designed to inform states and organizations that analyze and present HAI data. This toolkit additionally provides recommendations on how to effectively share and communicate HAI metrics targeted to the public report’s audience.
HAI report authors are advised to review the analysis and display recommendations in the toolkit and implement the strategies, to the extent possible, in consultation with internal and external stakeholders.

Evaluation on the toolkit is encouraged, and continued research in the field is necessary to learn more about how to make HAI information most useful to the report audience, especially to healthcare consumers. Please see the “Evaluation” chapter of the toolkit to provide the workgroup with any feedback as you begin to implement the toolkit.

**Background**

Over the past decade, states have passed legislation and/or regulation to collect and report HAI data to public health or patient safety authorities.

According to Edmond and Bearman (2007), theoretically, there are four ways that public reporting can improve healthcare quality:

1. remediation (hospitals make a concerted effort to improve quality)
2. restriction (licensing and accreditation organizations use the data to restrict provision of care by poor performers)
3. removal (poor performers discontinue providing services)
4. competition (between providers on the basis of improving quality to improve market share)

However, to drive performance and improve healthcare quality, the data must be presented in a way that is meaningful and understandable by the intended audience(s).

Federal agencies such as the CDC and the Centers for Medicare and Medicaid Services (CMS) as well as consumer groups (e.g., Consumers Union, the Leapfrog Group) publicly report HAI data for a variety of purposes, including informing policy development, evaluating progress toward infection reduction targets, and aiding consumers in making decisions about healthcare. Although multiple stakeholder groups use the same data source (NHSN), their varying methods, time periods, populations, and presentation strategies can lead to conflicting results and different conclusions. This can cause confusion for consumers who are trying to use the information to make educated decisions, and for healthcare providers and public health researchers who view and analyze the reported data from multiple publications.

CSTE position statements from 2010-2012 (10-ID-28, 10-SI-05, 11-SI-03, 12-ID-06) made efforts toward standardizing HAI surveillance methods and promoting the complete and accurate reporting of HAIs, but did not specifically address data presentation methods. As HAI reporting requirements and mandates have matured and grown within states, so too have the individual approaches to the presentation of HAI statistics and measures in published reports and online data dashboards. Although consensus groups like the Healthcare Infection Control Practices Advisory Committee (HICPAC) have published standards on essential elements of an HAI reporting system and on HAI surveillance (McKibben et al., 2005; Talbot et al., 2013), most of the focus
to date has been on the specific measures that are collected and reported, and not on the manner in which the data are displayed. For example, the most recent HICPAC guidelines address the public reporting of HAI surveillance data and outline some of the limitations and unintended consequences of using HAI surveillance data for inter-facility comparisons (Talbot et al., 2013). In light of this absence of standardization of NHSN HAI data presentation strategies, CSTE passed a policy position statement in June 2013 (13-ID-02) calling for the establishment of a multidisciplinary workgroup chaired by CSTE and CDC to develop a toolkit of best practices and recommended methods of presenting HAI measures and statistical information, including analytic standards, to a variety of audiences. A list of workgroup members is provided in the “Workgroup Members and Acknowledgments” chapter of the toolkit.

One objective of an HAI public report is to inform and empower the consumers’ choice of healthcare provider. Despite this goal, there is evidence to suggest that very few consumers are actually using healthcare quality data when making healthcare decisions. A 2008 poll by the Kaiser Family Foundation found that 30% of Americans said they had seen healthcare quality data used in comparisons of hospitals, physicians, or insurance plans, but only 14% of Americans had used this information to make healthcare-related decisions (The Henry J. Kaiser Family Foundation, 2008). McGuckin and colleagues (2014) note that “the foundation of consumer awareness is engagement” and suggest that to increase consumers’ awareness of HAI public reports, consumers should be involved in the development of the information. Further, McGuckin notes that consumers should receive detailed instructions on how to access and use the information provided. In response to this evidence, consumers and advocacy groups were involved in the design and testing of this toolkit and its HAI report templates.

Policymakers and healthcare providers also are key stakeholders that use and interpret publicly reported HAI data. For this particular audience, it is important that the analytic methods and data caveats are clearly delineated in the report to aid in transparency and trust of the reported data. In 2005, only 30% of physicians surveyed believed that the healthcare quality measures displayed in a public report were generated from accurate data (Jones, 2012).

There are several obstacles to the development and implementation of HAI display standards. A variety of process and outcome measures exist for assessing facility performance (in regards to HAI prevention), and many of them have complex underpinnings. At-risk populations and denominator calculations vary between infection types (e.g., urinary catheter days for catheter-associated urinary tract infections, surgical procedures for surgical site infections, patient days for *Clostridium difficile* infections). Some measures are risk-adjusted and are compared to a reference population, such as the standardized infection ratio (SIR), a measure that compares the observed number of infections in a facility or state to a predicted number based on national, historical baseline data. Others, like infection rates, may be crude, stratified, or risk-adjusted, and may or may not be compared to another population. Another challenge influencing the establishment of data presentation standards is the fact that different states may have regulations or legislation that prescribe how and when data are to be published and in what format.
HAI data analyses are complex, and need to be displayed in ways that are accessible to different audiences with varied levels of mathematical sophistication and knowledge of HAIs. As the science and practice of public reporting of HAI measures has progressed, some states and regions have involved consumer and stakeholder input to identify the data elements and presentation strategies that are of greatest interest to different groups and that maximize comprehension of the data.

Some examples from state HAI programs include:

- **Maryland**: Prior to creating web-based public reports of HAI data, two focus groups were conducted; one of consumers and one of healthcare professionals. After identifying differences in the audiences’ ability to understand and interpret the presentation options presented, two websites were produced, each with a report tailored to the intended audience. The consumer site presents the number of observed and predicted infections and an SIR symbol noting a comparison between the facility and the baseline national experience. Alternatively, the report for healthcare professionals contains more data and is available at a more granular level.

- **New Mexico**: As part of a regional collaborative on HAI website design, four focus groups were held with members of the general public to gather information on their interest in and current familiarity with HAI data, preferences for information on an HAI website, and to get feedback on several possible displays of HAI data. Despite preferring a visualization that was thought to be simple, consumers still did not demonstrate understanding of the data they were viewing and did not use the data that were reported.

- **Virginia**: Numerous stakeholder groups including infection preventionists, members of the multidisciplinary statewide HAI Advisory Committee, and a patient/consumer advocacy group were engaged to gather input when the state health department was developing a new central line-associated bloodstream infection report for healthcare providers and the general public. The patients/consumers were interested in highlighting the hospitals that achieved zero infections during the time period. Advisory Committee members and health department epidemiologists stressed the importance of including confidence intervals with the reported data to show statistical significance. Infection preventionists favored a color scheme in which facilities that were statistically similar to the national experience were in blue, while consumers preferred the “stoplight” colors of red, yellow, and green (where red indicated that a hospital had statistically more infections than predicted and green indicated the hospital observed statistically fewer infections than predicted).
- **Washington:** HAI program staff have been engaged in a variety of studies, collaborations, and research projects to examine the evidence behind public reporting of hospital performance data. A paper published by Birnbaum et al. (2010) explains an approach to improving the usage and impact of hospital comparison websites that involved developing prototype reports based on design principles to address issues related to poor usage and impact, and conducting focus group evaluations to test the prototypes. Research by Amini and colleagues (2013) examines the credibility and user-friendliness of state websites that publicly report hospital infection rates.

Other organizations and research groups have studied the issue of effective presentation of health data, including quality and patient safety information. For example, in 2010, Aligning Forces for Quality (AF4Q), a Robert Wood Johnson Foundation initiative, sponsored a guide describing how to display comparative quality information that consumers can understand and use (American Institutes for Research, 2010). According to this document, there are three goals of a good display of comparative information:

1. Make it easy to identify and understand patterns.
2. Help users focus on topics or providers of interest.
3. Reduce the amount of information for users.

In addition, reports should strive to combat two common problems: “data overload” (too much information to process and use), and “bewilderment” (users can’t find the information they want or can’t understand what they have).

The AF4Q guide includes a checklist of nine criteria that identifies ways to improve the effectiveness of quality data display. The criteria address domains such as:

- Use plain language
- Distinguish clearly between high and low performers
- Be concise (i.e., allowing users to pay attention to what matters to them most)
- Use a consistent display manner throughout the report
- Show the performance of multiple facilities (or providers) at the same time
- Show how local or state performance compares to national performance (i.e., identify the level of quality across the facilities/providers in a community)
- Target the information needs of the audience
- Highlight areas in which different facilities (or providers) perform well and not so well
- Bring different pieces of information together to choose the provider that is best for the user

**Impact**

Improving the analysis and presentation of HAI data has several potential public health impacts. In addition to improving the ability for public health to meaningfully monitor trends in the HAI data, these best practices aim to improve stakeholders’ capacity to understand and use HAI data. Following best practices in an HAI report can ensure that
all recipients of HAI data are provided with adequate information about the importance, meaning, and interpretation of specific measures and are given guidance and support in using the information. This will help avoid common pitfalls that lead to misinterpretation of the data.

Using a consistent data presentation framework can increase healthcare providers’ and consumers’ trust in the data. If providers understand and trust the data, it may encourage them to more actively use the information to improve the quality of care in their facility. By removing some of the confusion and conflicting results that exist currently, consumers’ understanding of HAI measures and statistical information can be deepened. Further, consistency of reporting and improved understanding may engage and motivate consumers to explore and use reports when making healthcare decisions. If consumers use the information to make informed choices, it may be likely that they will obtain high-quality healthcare for themselves and their family members. Collectively, many consumers making informed choices may stimulate quality improvement among providers and help healthcare facilities continue to work toward patient safety and infection prevention goals.