Hand hygiene compliance monitoring: current perspectives from the USA

John M. Boyce\textsuperscript{a,b, *}

\textsuperscript{a}Chief, Infectious Diseases Section, Hospital of Saint Raphael; \textsuperscript{b}Clinical Professor of Medicine, Yale University School of Medicine, New Haven, CT, USA

Summary Monitoring hand hygiene compliance and providing healthcare workers with feedback regarding their performance are considered integral parts of a successful hand hygiene promotion program. Direct observation of care providers by trained personnel is currently considered the gold standard. Advantages include the ability to determine if hand hygiene is being performed at the correct times, establish compliance rates by healthcare worker type, and assess hand hygiene technique. However, observation surveys are time-consuming, permit observation of only a small fraction of all hand hygiene opportunities, and can be influenced by inter-rater reliability. Comparison of compliance rates obtained through observation surveys is problematic due to lack of standardization of criteria for compliance and observation techniques. Self-reporting of compliance is not sufficiently reliable to be useful. Monitoring the usage of hand hygiene products requires much less time and can be performed on an ongoing basis, and is less complicated. However, it does not provide information about the appropriateness and quality of hand hygiene practices or compliance rates by health-care worker type. Furthermore, it is not clear how product usage correlates with compliance established by observational surveys. Electronic methods for monitoring compliance require further evaluation before they can be routinely recommended. Clearly, further research is needed to develop efficient, reliable, and reproducible methods for monitoring hand hygiene compliance.

Introduction

Hand hygiene guidelines published by the Centers for Disease Control and Prevention and by the World Health Organization emphasize the importance of monitoring hand hygiene compliance and providing healthcare workers (HCWs) with feedback regarding their performance as components of multimodal hand hygiene promotion programs.\textsuperscript{1,2} Approaches to monitoring hand hygiene include direct observation of HCWs, self-reporting by health-care personnel, measurement of hand hygiene product usage as a proxy for compliance, and electronic methods for monitoring
Establishing and measuring hand hygiene practices. Each of these approaches has advantages and disadvantages, and currently no ideal method of monitoring hand hygiene compliance among HCWs has been developed. The purpose of the present review is to describe measurement methods currently used, or under consideration for use, in the United States.

Direct observational surveys

Currently, observational surveys conducted by trained personnel (often infection control professionals) are considered the gold standard for monitoring hand hygiene compliance practices among HCWs. Advantages of direct observational surveys include the fact that they are currently the only method that can determine all of the following important components of hand hygiene: appropriateness of hand hygiene practices, hand hygiene technique, and compliance rates by healthcare worker type. Observational surveys can detect whether or not hand hygiene is performed appropriately before, during, and after contact with patients or their environment, and can provide information about whether HCWs apply hand hygiene products to all surfaces of their hands for an appropriate length of time. Establishing compliance rates for different groups of HCWs can help tailor further educational and motivational efforts towards those individuals who demonstrate the greatest need for improvement.

However, direct observational surveys have a number of disadvantages. Such surveys require training of observers and surveys of reasonable size are time-consuming (and therefore, costly). Insufficient training of observers can result in problems of inter-rater reliability and either overestimation or underestimation of true compliance rates. Because they are so time-consuming, most surveys provide information regarding only a tiny fraction of all hand hygiene opportunities that occur in healthcare settings, raising questions about the statistical validity of the results obtained. If HCWs realize that they are being observed, they may unintentionally improve their performance during observation periods (Hawthorne effect).

Although observational surveys presently provide the most complete information regarding hand hygiene practices among HCWs, comparison of compliance rates between facilities is problematic due to differences in the survey methods employed. Currently, health-care institutions often do not use well-standardized criteria for establishing compliance before, during, and after an episode of patient care, and may or may not consider contact with the patient’s immediate environment as an indication for hand hygiene. Some institutions may require hand hygiene prior to donning non-sterile gloves for patient care as a criterion for full compliance with hand hygiene, while other institutions do not use this criterion. Many institutions monitor the rate of hand hygiene compliance (number of times hand hygiene was performed/number of hand hygiene opportunities), but do not record information about whether alcohol hand rub or soap and water were applied to all surfaces of the hands and fingers for adequate amounts of time (greater than 15 seconds). In some facilities, HCWs are not considered compliant unless all aspects of hand hygiene during a patient care episode (hand hygiene before and after patient contact using appropriate technique, and glove use when indicated) are performed as recommended (www.IHI.org, accessed June 2007). Some institutions utilize trained infection control professionals to perform observational surveys, whereas others utilize ward-based nurses, nurse technicians, or other healthcare volunteers as observers. Although patients in some facilities have been encouraged to ask care givers whether they have cleaned their hands prior to contact, the role of patients in measuring compliance rates among HCWs has not been established. Other aspects of observational surveys that are not standardized include the level of training of observers, the duration of observational episodes (e.g., 20 minutes to three hours), and the number of shifts and days of the week on which surveys are conducted.

The tools used by health-care institutions for recording the results of observations also vary considerably, as illustrated by examples of audit tools available on various Internet web sites (see below). A majority of institutions appear to use paper-based audit tools, while others use palm-based devices for entering observations into electronic databases.

Changing observational survey methods over a period of time within the same facility can also complicate interpretation of long-term trends in compliance. For example, in our institution, compliance rates on some nursing units were less than 40% when experienced infection control professionals performed observations, but increased to greater than 80% when ward-based quality improvement nurses (who received brief training) were asked to perform observations. The dramatic increases in compliance could not be explained by the extent or type of educational sessions carried out between the two surveys, and more likely represented differences in the interpretation...
of compliance criteria or observation techniques utilized by the two groups of observers.

Self-reporting by HCWs

Self-reporting of hand hygiene compliance by HCWs has been used in a number of facilities. The appeal of this method relates to the fact that self-reporting of hand hygiene activities requires little time on the part of infection control or quality improvement personnel. A variety of study designs have been used in such studies, making direct comparison of study results problematic. For example, in one study direct observations of hand hygiene activities on multiple nursing units were followed on the same day by administration of self-reporting questionnaires to healthcare workers who had been observed. In another study, by Larson et al., 106 nurses completed a diary card after one shift each month for two years, and the results were compared to observations made at random intervals. Individuals were not identified by name on diary cards or observational surveys, so it was not possible to link self-reports directly to observed compliance rates. A study conducted by O'Boyle et al. analyzed self-reports of hand hygiene activity of individual nurses, and compared the findings to observations performed on the same nurses. Tibballs covertly observed physicians, and then verbally asked them to estimate their handwashing compliance rate before patient contact. In general, HCWs tended to overestimate their level of compliance, and results often did not correlate well with the results of observational surveys. For this reason, experts do not currently recommend the use of self-reporting methods as a primary method for establishing compliance levels. Additional studies of self-reporting methodologies are needed to determine if more accurate compliance rates can be achieved by this approach.

Monitoring hand hygiene product usage

Recording the amount of hand hygiene products (soap and/or alcohol-based hand rubs) has gained popularity as a method of determining if the frequency of hand hygiene is increasing in healthcare facilities. Advantages of measuring product usage as a proxy for hand hygiene compliance include the fact that it is much less labor intensive than observational surveys, is feasible on all patient care areas and in multiple types of healthcare facilities, and does not introduce any selection or observer bias. Determining the amount of product used may be established by counting the number of empty containers that are replaced on nursing units, by determining the number of liters distributed to nursing units throughout the facility, or simply by recording the amount of product purchased by the facility each month or each quarter.

Product usage is often expressed as the number of liters or grams used/1000 patient-days or per bed-day. For example, at the Hospital of Saint Raphael, the amount of alcohol-based hand rub distributed to each ward was recorded prospectively over a period of three years, and usage was expressed the number of liters used/1000 patient-days. Observational surveys of hand hygiene compliance were conducted by experienced infection control professionals on four occasions during the same three-year period. Linear regression revealed that there was a strong correlation (R²=0.98) between increasing hand hygiene compliance and the volume of alcohol-based hand rub used/1000 patient-days (unpublished data). Similarly, Eckmanns et al. found a relatively high correlation between alcohol-based hand rub consumption and hand hygiene compliance determined by observations. Of interest, the latter investigators reported that neither of these variables correlated significantly with the rate of transmission of healthcare-associated pathogens in intensive care units. Further studies are needed to determine if a strong correlation exists between observed hand hygiene compliance and product usage over prolonged time periods.

Another method that is utilized by numerous facilities involves recording the amount (ml) of soap used on each nursing unit per bed-day. Dividing the volume (ml) of soap and alcohol-based hand rub used by 1.7 (the average amount of product used for each hand hygiene episode) yields the estimated number of hand hygiene events that occurred on the unit. The estimated number of hand hygiene events is then divided by the number of bed-days for the respective unit, yielding the number of hand hygiene events/bed-day. Data can be submitted electronically to a central Internet-based data analysis center (www.hhreports.com), which provides each facility with time-trend data and a comparison with comparable nursing units in facilities of similar size. Advantages of this approach include that fact that such measurements are relatively easy to conduct and are feasible in a variety of healthcare settings.

Electronic counting devices placed inside soap or alcohol-based hand rub dispensers have also been used to monitor product usage. In one
Hand hygiene compliance monitoring: current perspectives from the USA

prospective study, recording the number of times soap dispensers were accessed before and after a hand hygiene promotion campaign documented that increased product usage was associated with decreases in the frequency of meticillin-resistant Staphylococcus aureus and vancomycin-resistant enterococci in high risk units. In another study, counting devices installed inside alcohol-based hand rub dispensers were used to compare the frequency of use of touch-free dispensers versus traditional wall-mounted dispensers. Further studies of how the use of such counting devices can contribute to monitoring and improving hand hygiene practices appear warranted.

Important shortcomings of measuring product usage as an indicator of hand hygiene compliance include the following: there is no way to determine if hand hygiene was performed at the appropriate times before, during or after patient care episodes, hand hygiene technique cannot be assessed, and no information on compliance by HCW type is generated. Furthermore, there are insufficient data about how well various product usage measurements correlate with the results of observational surveys conducted by trained personnel. Clearly, further studies are needed to determine the role of product usage measurements in comprehensive hand hygiene promotion programs.

Electronic monitoring with voice prompts

Electronic motion sensors that detect entry/exit of persons into patient rooms have also been used to estimate hand hygiene compliance rates in healthcare settings. Swoboda et al. conducted a three-phase study that involved electronic monitoring of room entry and exit plus hand hygiene observations in Phase I, electronic monitoring and computerized voice prompts for failure to perform hand hygiene upon exiting the room in Phase II, and electronic monitoring only during Phase III. In addition to monitoring room entry and exit, sensors were attached to toilets, sinks, and soap and waterless antiseptic dispensers to estimate the frequency of hand hygiene during episodes of patient care. During Phase I, hand hygiene compliance determined by observation was 44%, while compliance estimated by electronic monitoring yielded a compliance rate of 21.6%. The difference was probably related to the fact that observations included only healthcare workers, while electronic monitoring included anyone who entered the room (including visitors). Based on electronic monitoring results, hand hygiene compliance increased from 19% in Phase I to 27% in Phase II when computerized voice prompts were used. During Phase III, electronically determined compliance was 24%, which was significantly higher than during Phase I.

The weaknesses of such electronic monitoring systems, with or without voice prompts for non-compliance, include their inability to provide information about whether hand hygiene was conducted before patient contact or during an episode of patient care, and to accurately assess compliance rates among healthcare workers specifically. Furthermore, additional studies are needed to assess the long-term acceptability of computerized voice prompts and the impact of such systems on healthcare worker hand hygiene compliance rates.

In other industries, systems exist that use wireless monitoring of dispenser use, electronic employee badges detect use by individual users, and reporting software that records time and date of each dispenser use. Data can be downloaded to a database for analysis, and some systems even include messages sent to employee pagers when non-compliant events occur. Potential shortcomings of such systems in a healthcare setting include employee concerns about tracking and recording of individual performance, the costs of installation and maintenance of such systems, and inability to determine accurately if a hand hygiene opportunity occurred during an episode of patient care.

Future directions

Given the important roles that monitoring compliance and providing healthcare workers with feedback play in improving hand hygiene compliance, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) developed a Consensus Measurement in Hand Hygiene Project in conjunction with experts from a number of healthcare organizations. The goal of the project, directed by Dr. Elaine Larson, is to define the best practices currently available for monitoring hand hygiene in healthcare facilities, and to offer guidance to healthcare facilities regarding the merits of the different approaches to monitoring hand hygiene. Experts on the JCAHO panel are members of JCAHO, the Association for Professionals in Infection Control and Epidemiology, the Society for Healthcare Epidemiology of America, the Centers for Disease Control and Prevention, the World Health Organization Global Patient Safety Challenge, and the Veterans Administration Healthcare System. Findings of the JCAHO project are expected to be available later in 2008.
Internet resources on hand hygiene monitoring

To obtain further information on monitoring hand hygiene compliance among healthcare workers, readers may find the Internet websites listed below useful. Some of the websites listed provide sample audit tools and instructions for monitoring hand hygiene. Institutions that apply for and are accepted as Complementary Test Sites for the WHO Global Patient Safety Challenge can obtain a variety of implementation tools including a form that can be used to monitor hand hygiene compliance.

- www.handhygiene.org
  - Click on Tools for monitoring tools
- www.va.gov/NCPS/SafetyTopics/HandHygiene/index.html
  - See Hand Hygiene Tools
- www.IHI.org
  - Search for “hand hygiene How To” to see HowTo Guide
- www.hhreports.com
- www.hopisafe.ch
  - Click on The Action Agenda, and then Observation
  - www.who.int/gpsc/en/index.html
  - See enrollment for Complementary Site Testing

Conclusions

Currently, the ideal approach for monitoring hand hygiene compliance has not yet been identified. For the present time, the best approach may be to use a combination of monitoring techniques. Indirect measurements such as monitoring product usage or dispenser accessions have the advantage of requiring less time and expertise, and can be used to monitor trends in the frequency of hand hygiene activity among healthcare workers. However, currently, direct observation of healthcare workers by trained observers provides the most accurate information about the performance of different categories of employees, whether healthcare workers are cleaning their hands at the indicated times before, during and after patient care, and whether personnel are using appropriate technique to clean their hands. Direct observations can also identify situations where HH performance is weak, and determine which educational interventions are needed.

Funding: None

Conflicts of Interest statement: The author is a consultant for GOJO industries, Advanced Sterilization Products, Clorox Corporation, Soap and Detergent Association, 3M Corporation.

References


