



Commonwealth of Massachusetts
Board of Registration in Medicine
Quality and Patient Safety Division

Advisory
Hand Hygiene

September 2018

This advisory is issued by the Board of Registration in Medicine (BORiM), Division of Quality and Patient Safety (QPSD). The goal of this advisory is to support health care facilities, ambulatory clinics and private physician practices in the review and development of their approaches to hand hygiene. While some references are provided, this advisory does not include a comprehensive review of the literature and is not intended to provide specific recommendations for evidence - informed practice.

Publication of this advisory does not constitute an endorsement by the BORiM of any studies or practices described in the advisory and none should be inferred.

This renewed focus is an effort to keep hand hygiene in the spotlight due to current compliance rates, which are largely below the internal goals set by health care facilities as required by the Joint Commission (TJC).¹

Introduction: Hand hygiene and healthcare-associated infections (HAI)

The association between hand hygiene and infection has been known for almost 200 years. Today there is enough scientific evidence that hand hygiene is the simplest, most effective measure for preventing nosocomial or healthcare-associated infections (HAI). HAI have been recognized for more than a century as a critical problem affecting the quality of patient care. The Centers for Disease Control and Prevention (CDC) states that “on any given day, approximately one in 25 U.S. patients has at least one infection, contracted during the course of their hospital care, demonstrating the need for improved infection control in U.S. health facilities”.² It is estimated that in the United States more than 75,000 people die annually

In 1847, Ignaz Semmelweis, an Austrian obstetrician, reported that the incidence of puerperal fever was reduced from approximately 20% to about 2% after establishing antiseptic hand cleansing.

¹ https://www.jointcommission.org/mobile/standards_information/jcfaqdetails.aspx?StandardsFAQId=1029&StandardsFAQChapterId=55&ProgramId=0&ChapterId=0&IsFeatured=False&IsNew=False&Keyword=

² <https://www.cdc.gov/handhygiene/index.html>

from HAI.³ HAI is a leading cause of death and costs the U.S. healthcare system and taxpayers up to \$45 billion annually.⁴

Hand hygiene

Hand hygiene refers to cleaning hands by handwashing with soap and water or using an alcohol-based hand sanitizer (antiseptic hand rub including foam or gel).

Handwashing: Washing hands with plain soap and water.

Alcohol-based hand sanitizer: Use of alcohol-based sanitizer (60% - 95% ethanol or isopropanol) to perform hand hygiene. Alcohol-based hand rub is the preferred method for decontaminating hands, *except* when hands are visibly soiled (e.g., dirt, blood, body fluids), or after caring for patients with known or suspected *C. difficile* or during a norovirus outbreak, in which case soap and water should be used.

Two major groups of microorganisms are found on the skin: organisms that normally reside on it (resident flora) and contaminants (transient flora). The pathogenic potential of the resident flora is low unless introduced into body tissue. Transient flora cause most hospital infections resulting from cross-transmission.

Indications for hand hygiene:

- Before eating
- Before and after having direct contact with a patient's intact skin (taking a pulse or blood pressure, performing physical examinations, lifting the patient in bed) even if gloves are worn
- Before donning gloves
- After contact with blood, body fluids or excretions, mucous membranes, non-intact skin, or wound dressings
- After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient
- After doffing glove
- When moving from a contaminated-body site to a clean-body site during patient care

Use of gloves: Wearing gloves is not a substitute for hand hygiene. Hand hygiene must be performed before donning and after doffing gloves. Medical grade glove use by health care workers (HCWs) is recommended to reduce the risk of contaminating HCWs' hands with blood and other potentially infectious material (OPIM) and to reduce the risk of transmission of microorganisms to patients and to the environment.

Medical grade gloves are intended for single-use. Sterile surgical gloves are required for surgical interventions. Some non-surgical care procedures requiring aseptic technique, such as central vascular catheter insertion, and therefore require the use of surgical gloves. The National Institute for Occupational Safety and Health (NIOSH) at the CDC mandates that gloves be worn

³ <https://www.nejm.org/doi/full/10.1056/NEJMoa1306801>

⁴ Scott II R. The direct medical costs of healthcare-associated infection in U.S. hospitals and the benefits of prevention. CDC. 2009. https://www.cdc.gov/hai/pdfs/hai/scott_costpaper.pdf

during all patient-care activities involving exposure to blood or OPIM that may be contaminated with blood, including contact with mucous membranes and non-intact skin.⁵

There is definitive evidence that gloves must be removed after care of a single patient and hand hygiene performed. Gloves should be changed and hand hygiene performed between activities that include moving from a “dirty,” area such as an open wound to a “clean” area. Gloved hands should also be changed and hand hygiene performed after contact with the patient surroundings such as medical devices or hospital equipment. Hand hygiene should always be performed when removing gloves.⁶

Other aspects of hand hygiene

The consensus recommendation is to strongly discourage the wearing of rings or other jewelry during health care. Several studies have shown that skin underneath rings is more heavily colonized than comparable areas of skin on fingers without rings.⁹

Health-care facilities should develop policies on the wearing of jewelry, artificial fingernails or nail polish by HCWs. These policies should take into account the risks of transmission of infection to patients and HCWs, rather than cultural preferences.

Long fingernails, either natural or artificial, can puncture gloves easily. They may also limit HCWs’ performance in hand hygiene practices. A growing body of evidence suggests that wearing artificial nails may contribute to the transmission of certain health care-associated pathogens. Consensus recommendations are that HCWs do not wear artificial fingernails or extenders when having direct contact with patients and natural nails should be kept short (approximately ¼ inch long).⁷

Mobile devices

A number of studies in the recent years demonstrated that mobile devices used by HCWs in health care settings were colonized and played a potential role in dissemination of pathogens.⁸ Recommendation for using mobile devices at hospitals should at minimum include⁹:

- hand hygiene prior to and after using mobile device;
- use clean hands, and never gloved hands to access device;
- clean and disinfect device if brought into a patient zone; and
- Never bring devices into a room with a patient with active *Clostridium difficile* infection.

⁵ United States Department of Labor, Occupational Safety and Health Administration. Occupational exposure to blood borne pathogens. Federal Register, 2001, 29CFR; 1030.

⁶ WHO Guidelines on Hand Hygiene in Health Care. 2009. <http://www.who.int/gpsc/5may/tools/9789241597906/en/>

⁷WHO Guidelines on Hand Hygiene in Health Care. 2009. <http://www.who.int/gpsc/5may/tools/9789241597906/en/>

⁸ Pyrek K, Mobile technology disinfection: contaminated devices pose threat to patients. Infection Control Today. 2017. <http://www.infectioncontrolday.com/transmission-prevention/mobile-technology-disinfection-contaminated-devices-pose-threat-patients>

⁹ Barnes S. Hand hygiene 2017. The state of the state. Infection Control Today. <http://www.infectioncontrolday.com/webinars/hand-hygiene-2017-state-state>

Special cases: *Clostridium difficile*

C. difficile infection increases hospital costs by 40% per case and put those infected at higher risk for longer hospital stays and readmission.¹⁰ Use of gloves and handwashing are essential for prevention of *C. difficile* infection in hospitals and other health care settings.¹¹ Gloves should be used when entering patients' rooms and during patient care for patients with known or suspected *C. difficile* infection. Hand washing should be performed every time after removing gloves. *Alcohol does not kill C. difficile spores, use of soap and water is more efficacious than alcohol-based hand rubs.*¹²

Performance indicators:

Hand hygiene performance in health care settings can be monitored directly or indirectly. Direct methods include direct observation, patient assessment or HCWs self-reporting. Indirect methods include monitoring consumption of products, such as soap or alcohol-based hand sanitizer, and automated/electronic monitoring.

Monitoring hand hygiene by direct methods

Observations are usually performed by trained and validated observers who observe care activity directly and count the occurring hand hygiene opportunities and determine the proportion being met by hand hygiene actions. The validation of observers is essential for the quality of observation data.

Direct observations allow collecting detailed information on health hygiene performance. This can comprise glove use, hand rubbing technique, application time, and other quality parameters that affect hand hygiene efficacy such as the wearing of jewelry and fingernail status. Whereas routine monitoring needs to be kept simple and straightforward, observations for research purposes can be even more detailed. A drawback of direct observations may be the resources required to implement a program to educate, train, validate, and schedule observers for observation.

In addition, direct monitoring approaches have some limitations due to the "Hawthorne effect". "Hawthorne effect" creates observation bias when HCW know they are being watched and therefore improve compliance with hand-hygiene guidelines¹³. On the other hand, this effect can be used deliberately to stimulate hand hygiene compliance in a promotional intention, rather than to obtain objective quantitative results. Obtaining a sustained and never-ending Hawthorne effect

The Hawthorne Effect is a well-documented phenomenon that affects many research experiments in social sciences. It is the process where human subjects of an experiment change their behavior, simply because they are being studied.

¹⁰ Magee G. et al. Impact of *Clostridium difficile*-associated diarrhea on acute care length of stay, hospital costs, and readmission: A multicenter retrospective study of inpatients, 2009-2011. *American Journal of Infection Control*. 2015;43:1148-1153

¹¹APIC. Guide to the Elimination of *Clostridium difficile* in Healthcare Settings. 2008

¹² Dubberke E, Gerding D. Rationale for Hand Hygiene Recommendations after Caring for a Patient with *Clostridium difficile* Infection. 2011. <https://www.shea-online.org/images/patients/CDI-hand-hygiene-Update.pdf>

¹³ McCambridge J. et al. Systematic review of the Hawthorne effect: New concepts are needed to study research participation effects. *Journal of Clinical Epidemiology*. 2014; 67: 267-277

associated with improved compliance with hand hygiene and decreased infection and cross-transmission rates could certainly represent an ideal perspective.¹⁴

Observation bias might be eliminated by keeping observations covert. Such observations, however, are not recommended in conjunction with promotional interventions because they can induce mistrust in the observed HCWs.¹⁵

Monitoring hand hygiene by indirect methods

In the quest for less expensive monitoring approaches, experts have used the consumption of hand hygiene products such as paper towels, alcohol-based hand rub or liquid soap to estimate the number of hand hygiene actions. Some studies have shown that the consumption of products used for hand hygiene correlated with observed hand hygiene compliance¹⁶, whereas others have not.¹⁷

Methods based on product consumption cannot determine if hand hygiene actions are performed at the right moment during care or if the technique is correct. The advantages, however, are that they are simple, can be continuous, and provide a global picture that remains unaffected by selection or observer bias. The amount of alcohol-based hand rub used by health-care settings has been selected as one of the indicators. Nevertheless, it has to be considered that this measure may not exactly reflect the product consumption by HCWs, but could include the amount used by visitors or patients, especially if the dispensers are located also in public areas of the health-care setting.

Technically sophisticated electronic monitoring systems for hand hygiene compliance are now available, but more data are needed to systematically demonstrate the evidence of the impact of electronic technology on hand hygiene monitoring, compliance, and outcomes.¹⁸

Hand hygiene compliance

Hand hygiene compliance is the mainstay of an infection prevention strategy and is the most well-established measure to prevent avoidable infection in healthcare settings.¹⁹

Compliance with hand hygiene recommendations varies between hospital wards, among professional categories of healthcare workers, and different working conditions. A review of hand hygiene studies by WHO found that baseline compliance with hand hygiene among health care workers was on average 38.7%.²⁰

¹⁴ Pittet D. Promotion of hand hygiene; magic, hype, or scientific challenge? *Infection control and Hospital Epidemiology*. 2002;23:118-119

¹⁵ WHO Guidelines on Hand Hygiene in Health Care. 2009.
<http://www.who.int/gpsc/5may/tools/9789241597906/en/>

¹⁶ Hugonnet S. et al. Alcohol-based handrub improves compliance with hand hygiene in intensive care units. *Archives of Internal Medicine*. 2002; 162;9:1037-1043

¹⁷ Van de Mortel T. et al. An examination of covert observation and solution audit as tools to measure the success of hand hygiene interventions. *American Journal of Infection Control*. 2006;34:95-99

¹⁸ APIC Implementation Guide. *Guide to Hand Hygiene Programs for Infection Prevention*. 2015

¹⁹ Pittet D. et al. Considerations for WHO European strategy on healthcare-associated infections, surveillance, and control. *Lancet Infection Diseases*. 2005;5:242-250

²⁰ WHO Guidelines on Hand Hygiene in Health Care. 2009.
<http://www.who.int/gpsc/5may/tools/9789241597906/en/>

The most recent systematic study on hand hygiene compliance suggested that the very best hand hygiene compliance achievable is around 57% (following a period of infection control interventions), with a mean of 34% at other times.²¹

In a landmark work published in 1999, the investigators identified hospital wide predictors of poor adherence to recommended hand hygiene measures during routine patient care.²² Predicting variables included professional category, hospital ward, time of day/week, and type and intensity of patient care, defined as the number of opportunities for hand hygiene per hour of patient care. In 2834 observed opportunities for hand hygiene, average adherence was 48%. In multivariate analysis, non-adherence was the lowest among nurses compared with other HCWs and during weekends. Non-adherence was higher in ICUs compared with internal medicine, during procedures that carried a high risk of bacterial contamination, and when intensity of patient care was high. In other words, the higher the demand for hand hygiene, the lower the adherence.

Measures to improve compliance:

- Make hand hygiene compliance an institutional priority and provide administrative support and financial resources
- Implement a multidisciplinary program designed to improve compliance to recommended hand hygiene practices.
- Routinely monitor hand hygiene compliance and provide feedback to personnel regarding their performance. Use reported data to guide improvement.

The inability over two decades to motivate HCW compliance with hand cleansing suggests that modifying hand hygiene behavior is a complex task, and no single intervention has been reported consistently improved hand hygiene compliance.²³

It is essential that hand hygiene opportunities, indications, and actions are clearly defined in health care organizations. Opportunities for hand hygiene action using alcohol-based hand sanitizer can be distinguished from those requiring handwashing with soap and water and simple structure indicators may be used to evaluate:

- the number of dispensers filled compared with the total number of dispensers in a unit;
- the number of dispensers in working order compared with the total number of dispensers in a unit ;
- the proportion of patient and treatment rooms with dispensers present at the point of care;
- the number of sinks in patient and treatment rooms and sink/bed ratio;

²¹ Kingston L. et al. Hand hygiene-related clinical trials reported since 2010: a systematic review. *Journal of Hospital Infection*. 2016;92:309-320

²² Pittet D. et al. Compliance with handwashing in a teaching hospital. *Annals of Internal Medicine*. 1999; 130:126-130

²³ Pittet D. Improving Adherence to Hand Hygiene Practice: A Multidisciplinary Approach. *Emerging Infectious Diseases*, 2001, 7,2:234-240

- the proportion of sinks equipped with soap and single-use towels.

Hand hygiene as any human health-related behavior is the consequence of multiple influences from our environment, education, and culture. While these influences are usually interdependent, some have more effect than others; when the actions are unwise, they are usually the result of trade-offs with acknowledged or denied consequences. Thus, this complexity of individual, institutional and community factors must be considered and investigated when planning and implementing hand hygiene programs.²⁴

In 2005, the WHO Alliance for Patient Safety launched a campaign – “Clean Care is Safer Care” – aiming to improve hand hygiene in health care. The campaign promotes a multimodal strategy consisting of five components (WHO-5)²⁵:

- system change,
- training and education,
- observation and feedback,
- reminders in the hospital, and
- a hospital safety climate.

Lately, additional strategies for improving hand hygiene have been evaluated, including those based on behavioral theory. A systemic review and meta-analysis of efficacy of interventions to promote hand hygiene in hospitals reported that WHO-5 intervention combined with goal setting, reward incentives and accountability provided the best improvements beyond those achieved by WHO-5.²⁶

Recently the Joint Commission Center for Transforming Healthcare published results of quality improvement (QI) collaborative interventions used various tools based on change management methods to improve hand hygiene compliance and accountability.²⁷ This approach identified specific causes of hand hygiene failures most prevalent at each facility and customized improvements efforts.

“Clean In, Clean Out” initiative at University of North Carolina Hospitals focused on engaging all health care personnel in monitoring and improving their own compliance. The initiative demonstrated a significantly increased hand hygiene compliance rate and significantly decreased HAI rate that resulted in overall savings of about \$5 million.²⁸

²⁴ Pittet D. Improving Adherence to Hand Hygiene Practice: A Multidisciplinary Approach. *Emerging Infectious Diseases*, 2001, 7,2:234-240

²⁵ http://www.who.int/gpsc/clean_care_is_safer_care/en/

²⁶ Luangasanatip N. et al. Comparative efficacy of interventions to promote hand hygiene in hospital: systematic review and network meta-analysis. *BMJ*, 2015;351:h3728 doi:10.1136/bmj.h3728

²⁷ Chassin M. et al. Improving hand hygiene at eight hospitals in the United States by targeting specific cause of noncompliance. *The Joint Commission Journal on Quality and Patient Safety*. 2015;41;1:4-12

²⁸ Sickbert-Bennett E. et al. Reduction of healthcare-associated infections by exceeding high compliance with hand hygiene practice. *Emerging Infectious Diseases*. 2016, 22,9:1628-1630

The Association for Professionals in Infection Control and Epidemiology (APIC) considers that a multimodal approach is the best strategy for implementing hand-hygiene improvement programs. Components of this approach include²⁹:

- hand hygiene culture change,
- support from organizational leaders,
- education and training,
- compliance monitoring,
- multidisciplinary teams,
- accessible hand hygiene products,
- reminders in the workplace, and
- outcome monitoring.

The Joint Commission will now issue a citation to a health care organization if during an on-site visit; a surveyor witnesses an employee failing to follow hand-hygiene guidelines.

Guidelines and Regulations

There have been many hand hygiene guidelines published in the past 20 years. In the United States, CDC is the main authority for the infection prevention and control guidelines. Guidelines from WHO, the Association of Professionals in Infection control (APIC), Canada, Australia, United Kingdom and other professional and international institutions can be very helpful for information and education about best practices and application of the latest scientific knowledge on hand hygiene.

In the United States compliance with hand hygiene guidelines is enforced through government regulatory agencies and accrediting organizations. Four primary agencies provide regulatory oversight for hand hygiene programs: Centers for Medicare and Medical Services (CMS)³⁰, Occupational Safety and Health Administration (OSHA)³¹, Food and Drug Administration (FDA)³², and Consumer Product Safety Commission (CPSC)³³. Two of the largest accrediting organizations for hospitals – The Joint Commission (TJC)³⁴ and Det Norske Veritas (DNVGL)³⁵ – also have hand hygiene requirements.

The World Health Organization's (WHO) "My five moments for hand hygiene"³⁶ and CDC Guidelines for Hand Hygiene in Health Care Settings³⁷ describe in detail hand hygiene performance and technics.

TJC requires that facilities follow either CDC or WHO guidelines to meet the patient safety goals. To ensure compliance with the National Patient Safety Goals 2018, the latest Hospital Accreditation Program requires that health care organizations implement "a comprehensive

²⁹ APIC Implementation Guide. Guide to Hand Hygiene Programs for Infection Prevention. 2015

³⁰ <https://www.cms.gov/>

³¹ <https://www.osha.gov/>

³² <https://www.fda.gov/>

³³ <https://www.cpsc.gov/>

³⁴ <https://www.jointcommission.org/>

³⁵ <https://www.dnvgl.us/assurance/healthcare/index.html>

³⁶ <http://www.who.int/gpsc/5may/background/5moments/en/>

³⁷ CDC. Guideline for Hand Hygiene in Health-Care Settings. 2002. <https://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf>

program that provides a hand-hygiene policy, fosters a culture of hand hygiene, and monitors compliance and provides feedback”³⁸.

Conclusion and recommendations

While a hand hygiene program alone cannot control disease transmission in health care settings, it remains the foundation of all effective prevention programs and the foundation upon which other practices are designed.

Hand hygiene programs are a critical component of infection-prevention programs for health care organizations.

Monitoring hand hygiene is important to understand current compliances with recommended practices and develop effective programs.

Multimodal hand hygiene programs are a cornerstone in accrediting standards, government regulations and professional society recommendations.

Health care organizations should follow either current CDC and/or WHO hand hygiene guidelines to comply with the National Safety Goals.

Resources: There are a variety of educational and information resources available to help health care organizations and health workers to improve and sustain hand hygiene program planning and implementation. The resources listed below are available at no charge from CDC, WHO, APIC and TJC:

- CDC: Hand Hygiene in Healthcare Settings. <https://www.cdc.gov/handhygiene/index.html>
- WHO: SAVE LIVES: Clean Your Hands. <http://www.who.int/infection-prevention/campaigns/clean-hands/en/>
- APIC: <https://apic.org/Professional-Practice/Overview>
- TJC: <https://www.jointcommission.org/>

³⁸ https://www.jointcommission.org/standards_information/npsgs.aspx