

Chapter 8. Interventions To Improve Hand Hygiene Compliance: Brief Update Review

Elizabeth Pfoh, M.P.H.; Sydney Dy, M.D., M.Sc.; Cyrus Engineer, Dr.P.H.

Introduction

Healthcare-associated infections account for approximately 80,000 deaths per year in the United States.¹⁻³ A worldwide systematic review found that the incidence of healthcare-associated infections ranged from 1.7 to 23.6 per 100 patients. Hospital costs directly related to healthcare-associated infections ranged from \$28.4 to \$33.8 billion in 2007 U.S. dollars.⁴ Yet these infections are frequently preventable through hand hygiene.

Substantial epidemiologic evidence supports that hand hygiene reduces the transmission of healthcare-associated pathogens and the incidence of health-care associated infections.⁵ The link between hand hygiene and improvements in healthcare-associated infections is hard to prove definitively in modern-day health care. However, the importance of hand hygiene is universally acknowledged by organizations such as the Joint Commission, World Health Organization (WHO) and Centers for Disease Control (CDC), which recommend or require hand hygiene practices and interventions to improve hand hygiene compliance in order to reduce health care-acquired infections.⁵⁻⁷ This review will therefore focus on interventions to improve compliance with hand hygiene, rather than on the efficacy of hand hygiene for reducing healthcare-associated infections.

Compliance with hand hygiene practices among health care workers has historically been very low, averaging 39 percent.⁵ The review on hand hygiene compliance and interventions aimed at improving it that was conducted for the original 2001 “Making Health Care Safer” report found that poor compliance has been documented in studies across hospital unit types and in various other settings. Workers tend to underestimate the importance of compliance and often overestimate their compliance with hand hygiene procedures.¹ The report concluded that future research studies needed to identify reasons for poor compliance and design sustainable interventions that target these factors. The aim of this review is to assess the evidence for the impact of interventions on hand hygiene compliance since that report.

What Is Hand Hygiene Compliance?

Hand hygiene is a general term for removing microorganisms with a disinfecting agent such as alcohol or soap and water.¹ Hand hygiene should be conducted by health care workers before seeing patients, after contact with bodily fluids, before invasive procedures, and after removing gloves.⁶ The WHO offers a slight variation by recommending five key moments when health care workers should practice hand hygiene: before patient contact, before an aseptic task, after bodily fluid exposure risk, after patient contact, and after contact with patient surroundings.⁵ The National Quality Forum’s “Safe Practices for Better Healthcare 2010 Update” and the Joint Commission recommend that organizations should implement CDC or WHO guidelines, encourage staff compliance with guidelines with category II evidence, and ensure staff comply with organizational rules regarding hand hygiene (see section below on implementation for details).^{6,7}

Monitoring health care workers' compliance with hand hygiene practices is vital for evaluating whether interventions are successful. WHO recommends using a validated methodology for training observers to directly monitor hand-hygiene using "My five moments for hand hygiene."⁵ Other methods for monitoring include patient-observations, measuring of hand hygiene product consumption (either by volume of product used or through electronic counting devices), and electronic hand hygiene compliance monitoring systems (e.g. real-time location systems, dedicated monitoring systems or video monitoring).⁸

Hand hygiene interventions include both single and multi-level interventions. These interventions include staff and/or patient education and involvement, feedback initiatives, cultural change, organizational change, social marketing, additional sinks or alcohol dispensers, or a combination of the above.^{1,9}

Advocates of hand-hygiene improvement interventions recommend that multimodal interventions are needed to induce sustained hand-hygiene practice improvements, and should be based on theories of behavior change. On the individual level, the intervention should target provider education and motivation regarding hand-hygiene practices; on the interpersonal level, patient empowerment and cues to action should reinforce proper hand-hygiene practices; and on the organization level, organizational structure and philosophy needs to be supportive of proper practices.⁵

How Have Interventions To Improve Hand Hygiene Compliance Been Implemented?

Several major hand hygiene compliance programs have been developed and made publicly available from the CDC, Institute for Healthcare Improvement, Joint Commission, and WHO, and are widely implemented in health care institutions.

The CDC has published a guideline, interactive training and educational materials, and posters for hand-hygiene compliance.¹⁰ The guideline provides suggestions for health care worker educational and motivational programs; these suggestions include stating a rationale for, and providing information regarding, when hand-hygiene is required; and providing proper hand hygiene techniques, methods to maintain skin health, expectations of managers, and indicators for glove use.¹¹ The interactive tools include a set of PowerPoint® slides and speaker notes that provide background information on the importance of hand-hygiene, indications on when to use hand-hygiene practices and how to properly clean ones' hands, and educational/motivational programs.¹² Promotional posters aiming to demonstrate proper hand-hygiene and remind health care workers of the importance of hand-hygiene are also available.⁶

The Institute for Healthcare Improvement, in collaboration with the CDC, the Association for Professionals in Infection Control and Epidemiology, and the Society of Healthcare Epidemiology of America, created a how-to guide on improving hand-hygiene among health care workers for organizations. This guide includes evidence-based interventions, goal-setting suggestions, evaluation suggestions, and measurement tools. The intervention is a multi-faceted approach with four key aims: (1) to improve knowledge of proper hand hygiene practice; (2) to have workers demonstrate hand hygiene knowledge; (3) to ensure the availability of alcohol-based rub and gloves at the point of care; and (4) to ensure that competency in hand hygiene is regularly verified, compliance is monitored, and appropriate feedback loops are in place.¹³

The Joint Commission created a monograph to help health care organizations properly measure hand hygiene performance. Content for the monograph came from examples of methods and tools submitted through the Consensus Measurement in Hand Hygiene Project and published

literature.¹⁴ The monograph includes a comprehensive review of three measurement methods, including surveys, measuring product use, and directly observing hand hygiene. Additional information includes a review of ways to display data, intervention strategies, and additional supplementary resources.

In 2009, the WHO published an extensive report, including a background on transmission of infections, guidelines for proper hand-hygiene protocol; social, cultural, and behavioral aspects of hand-hygiene; consensus recommendations; process and outcome measurement; and patient involvement in hand-hygiene.⁵ A multimodal strategy was found to be necessary to improve compliance; therefore recommendations for proper hand hygiene span different levels. For providers, washing hands when visibly dirty, and using alcohol-based hand rub before and after contact with a patient, contaminated surface, or medicine is critical. Additionally, they should not wear artificial nails. Organizations should provide information to workers regarding hand-hygiene practices that reduce skin irritation and provide lotions or creams to minimize the occurrence of skin irritation. When designing an intervention to increase proper hand hygiene, a multi-faceted, multi-modal intervention should be used, practices should be monitored, and feedback loops should be implemented. Health care administrators should ensure structural and cultural factors are conducive to hand-hygiene practices, including ensuring access to alcohol-based hand-rub and/or a continuous water supply at the point of care, and making compliance with a multi-faceted intervention an institutional priority.⁵ Individual factors, such as normative beliefs (peer behavior), perceived control, and attitude (awareness of being observed) should also be addressed since they were found to be important predictors of hand hygiene adherence. The WHO provides training and education tools such as a template for creating an action plan, an observation form for monitoring hand-hygiene compliance, training films, and educational brochures. All tools were tested in eight official pilot sites in seven countries before being finalized.⁵

What Have We Learned About Hand Hygiene Interventions?

A recent review determined that a successful hand hygiene educational program has several key features. These features include reinforcement of hand hygiene messages; knowledge of health care workers' perceived importance of hand hygiene and its role in prevention of healthcare-associated infections; monitoring and feedback of hand hygiene practices; practical education tools; role-modeling by senior staff; and supportive infrastructure and management. Interventions should be multimodal, and teaching methodology should be progressive and include different types of methods. The educational program itself should be designed to include local structure, priorities, and resources.¹⁵ Additionally, as stated above, across several studies, the 2009 WHO report found hand hygiene practices should be multimodal, and structurally and culturally tailored to improve compliance with hand hygiene.⁵

What Methods Have Been Used To Improve Hand Hygiene Compliance?

The 2001 "Making Health Care Safer" report discussed studies that aimed to improve hand hygiene through education, feedback, installation of sinks and alcohol-based solution, and organizational changes.¹ "Making Health Care Safer" included 14 non-randomized controlled or before-after studies, 13 of which measured hand hygiene compliance through direct observation, most in the intensive care unit setting. Interventions included increasing sink or alcohol-based

solution availability, education, and multifaceted interventions, including feedback. Ten studies found a statistically significant increase in compliance, and four did not. Three studies evaluated longer-term results and found that compliance rates decreased after the intervention ended.¹

Impact of Interventions on Hand Hygiene Compliance

Since 2001, two major systematic reviews have been published on the impact of interventions on hand-hygiene compliance.

A 2010 Cochrane systematic review (an update of a 2007 review) found insufficient evidence that hand-hygiene interventions improve hand hygiene in the hospital setting.⁹ The review included randomized controlled trials, controlled clinical trials, controlled before and after studies, and interrupted time series analyses that met the criteria of the Cochrane Effective Practice and Organization of Care Group from 1980-2009. Eligible outcomes included indicators of compliance with hand hygiene or proxy indicators such as use of product; operating room studies were excluded. Four studies were included, with one study finding a statistically significant improvement in hand hygiene 4 months post-intervention, two studies finding a statistically significant increase in product use which was sustained at one site for 2 years, and one study finding no effect in the intervention compared with the control group 3 months post-intervention. Studies focused on educational campaigns and promotion of guidelines, as well as a multifaceted intervention to improve compliance. Simple substitution of a product with alcohol-based hand rub did not significantly increase product use.⁹

A 2008 systematic review addressed studies evaluating hand-hygiene interventions and healthcare-associated infections in acute and long-term care settings (not the impact of the interventions on compliance with hand hygiene).¹⁶ Studies included multifaceted initiatives, introduction of new hand-hygiene products, and implementation of infection control practices and policies, surveys, and electronic monitoring. The review included before and after studies with and without control groups and cohort studies with no controls. Eighteen of 31 included studies (58%) reported a statistically significant reduction in healthcare-associated infections with the intervention compared with the control group; some studies also included other factors that may have influenced the reductions in healthcare-associated infections.

Patient Engagement

A 2011 review by McGuckin and colleagues found evidence of the importance of patient engagement or empowerment and multi-model strategies in hand-hygiene interventions. The authors found that patient empowerment comprised patient participation, knowledge, skills, and a facilitating environment for their participation in hand hygiene. The majority of patients agreed that they would ask their health care workers to wash their hands (80% to 90%), especially if encouraged to ask. However, the authors found scarce literature on the efficacy of patient empowerment interventions to improve health care worker hand hygiene and were unable to conduct a traditional evidence-based review.¹⁷

Conclusions and Comment

In conclusion, although it is well-accepted that hand hygiene is a critical patient safety practice for reducing healthcare-associated infections, compliance with this practice is often low. Well-developed tools are available for implementing hand hygiene interventions, although high-quality evidence demonstrating which interventions are most effective is lacking. Reviews have found that the results of hand hygiene compliance interventions were mixed, with effectiveness

waning over the long term. A recent systematic review focusing on higher quality evidence found only four studies, three of which showed a significant impact. Another recent review found mixed results for the impact of hand hygiene interventions on rates of healthcare-associated infections. A variety of interventions to improve hand hygiene are being implemented and promoted by various U.S. and international organizations, particularly educational programs, monitoring, and feedback. Interventions should be multimodal, addressing providers' knowledge, attitudes, and beliefs regarding hand hygiene, as well as strategies for behavioral change, and should ideally be tailored to institutional needs as well as different provider groups and health care situations. Health care administrators embarking on a hand hygiene intervention should take advantage of the tools developed by the CDC and the WHO. New strategies, such as patient engagement in hand-hygiene interventions, are an emerging area with only a few studies assessing their effectiveness, and need further research on how best to implement them effectively. Finally, research may be directed toward understanding the effectiveness of specific elements of hand hygiene interventions, and the context in which they are implemented, in order to understand which combinations lead most reliably to success. A summary table is located in Table 1, Chapter 8.

Table 1, Chapter 8. Summary table

Scope of the Problem Targeted by the PSP (Frequency/Severity)	Strength of Evidence for Effectiveness of the PSPs	Evidence or Potential for Harmful Unintended Consequences	Estimate of Cost	Implementation Issues: How Much do We Know?/How Hard Is it?
Common/Moderate	Low	Low	Low	Moderate/Moderate

References

- Lautenbach E. Chapter 12. Practices to Improve Handwashing Compliance. In *Making Healthcare Safer: A critical analysis of patient safety practices*. Shojania KG, Duncan BW, McDonald KM, Wachter RM, Markowitz AJ. Eds. Agency for Healthcare Research and Quality. 2001. <http://archive.ahrq.gov/clinic/ptsafety>. Accessed November 17, 2011.
- Jarvis WR. Selected aspects of the socioeconomic impact of nosocomial infections: morbidity, mortality, cost, and prevention. *Infect Control Hosp Epidemiol* 1996; 17(8):552-7.
- Klevens RM, Edwards JR, Richards CL Jr et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep* 2007;122(2):1606.
- Scott RD (2009) The direct medical costs of healthcare-associated Infections in U.S. hospitals and the benefits of prevention. Atlanta, GA: Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases Coordinating Center for Infectious Diseases Centers for Disease Control and Prevention.
- World Health Organization. WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge. 2009. www.who.int/gpsc/country_work/en/. Accessed November 22, 2011.
- Centers for Disease Control And Prevention. Hand Hygiene in Health Care Settings: Hand hygiene basics. May 19, 2011. www.cdc.gov/handhygiene/Basics.html. Accessed November 16, 2011.

7. National Quality Forum. Safe Practice 19: Hand Hygiene. In *Safe Practices for Better Healthcare: 2010 Update*. www.qualityforum.org/Publications/2010/04/Safe_Practices_for_Better_Healthcare_%E2%80%932010_Update.aspx. Accessed November 18, 2011.
8. Boyce JM. Measuring healthcare worker hand hygiene activity: current practices and emerging technologies. *Infect Control Hosp Epidemiol* 2011; 32(10):1016-28.
9. Gould DJ, Moralejo D, Drey N, Chudleigh JH. Interventions to improve hand hygiene compliance in patient care. *Cochrane Database Syst Rev* 2010; (9):CD005186.
10. Centers for Disease Control And Prevention. *Hand Hygiene in Health Care Settings: Training*. May 19, 2011 www.cdc.gov/handhygiene/training/interactiveEducation/. Accessed November 16, 2011.
11. Centers for Disease Control and Prevention. *Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA HandHygiene Task Force*. *MMWR* 2002;51(No. RR-16).
12. Centers for Disease Control and Prevention. "Hand Hygiene in Healthcare Settings-Core"2003. www.cdc.gov/handhygiene/training.html. Accessed November 22, 2011.
13. Institute for Healthcare Improvement. *How-to Guide: Improving Hand Hygiene*. 2006. www.ihl.org/knowledge/Pages/ToolsHowtoGuideImprovingHandHygiene.aspx Accessed November 16, 2011.
14. Joint Commission. *Measuring Hand Hygiene Adherence: Overcoming the challenges*. 2009. www.jointcommission.org/Measuring_Hand_Hygiene_Adherence_Overcoming_the_Challenges/
15. Mathai E, Allegranzi B, Seto WH et al. Educating healthcare workers to optimal hand hygiene practices: addressing the need. *Infection* 2010; 38(5):349-56.
16. Backman C, Zoutman DE, Marck PB. An integrative review of the current evidence on the relationship between hand hygiene interventions and the incidence of health care-associated infections. *Am J Infect Control* 2008; 36(5):333-48.
17. McGuckin M, Storr J, Longtin Y, Allegranzi B, Pittet D. Patient empowerment and multimodal hand hygiene promotion: a win-win strategy. *Am J Med Qual* 2011; 26(1):10-7.