

Hand Hygiene: Washing and Disinfection

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Although Oliver Wendell Holmes had already recognized the role of caregivers' hands in the transmission of puerperal fever, the Hungarian physician Ignaz Semmelweis was the first to show, in the mid-19th century, that spread of this disease could be prevented by handwashing.¹ Bacteria and viruses are commonly transmitted on the hands of health care workers, and handwashing is considered the single most important intervention to prevent such spread.² During their daily work, health care workers can acquire pathogens from infected patients and transmit them to other patients. Numerous epidemics have been traced to the so-called transient flora on the contaminated hands of health care workers. There are fewer data on the transmission of pathogens in the dental setting; however, given the number of bacteria and viruses found in the mouth and the nasopharynx and the potential for aerosolization of blood and saliva during dental procedures, it is likely that transmission is common in this setting as well.

Compliance with Handwashing Guidelines

In spite of these concerns, compliance with handwashing guidelines remains a problem in most health care settings and does not usually exceed 40%, even under controlled study conditions. Although self-reported handwashing rates among dentists are better, compliance in this group is still less than ideal.³ The Canadian Dental Association recommends that hands be washed with germicidal soap before and immediately after the use of gloves.⁴ Using gloves does not obviate the need for handwashing, because the gloves themselves may become contaminated as a result of punctures or the hands may become contaminated after the gloves are removed.⁵

Given the strong case for handwashing, why does compliance remain so poor in health care settings? A number of factors are associated with low rates of compliance with handwashing guidelines: lack of availability of sinks, adverse effects of handwashing on skin condition, high workload and low perceived risk.⁶⁻¹⁰ Although continuing education is a useful intervention to improve compliance, it is difficult to sustain a change in behaviour without continual reinforcement. Compliance also depends on the time required to perform adequate handwashing relative to the time available. Washing hands for 15 seconds achieves a microbial kill of $10^{0.6-1.1}$ and

for 30 seconds, $10^{1.8-2.8}$.¹¹ However, handwashing of less than 10 seconds' duration is common in clinical practice.¹² A mathematical model has suggested that, because of the time required, 100% compliance with current handwashing guidelines may not be possible without adversely affecting patient care.¹³ Although this model was validated in a medical intensive care unit, the same would hold true in dental practice, given the number of patient contacts and current recommendations that dental health care workers wash their hands before glove placement and after glove removal.

Hand Disinfection with Alcohol-Based Products

Semmelweis can perhaps more correctly be considered the "father of disinfection," rather than of handwashing, given that the chloride of lime solution he introduced was a powerful skin disinfectant, not a soap. Numerous studies have shown that solutions containing 60% to 70% alcohol are effective skin disinfectants. These preparations are more effective than antimicrobial soaps, reducing bacterial load on the hands by approximately 10^4 .^{14,15} For this reason, agents containing alcohol, with or without other antimicrobial compounds, have become increasingly popular as hand disinfectants in Europe.

As mentioned previously, educational programs to improve compliance with handwashing have, at best, achieved only transient improvements. One approach to improving compliance is to find ways of decreasing the time required for hand hygiene, since health care workers often cite lack of time as one of the greatest deterrents to handwashing. Voss and Widmer estimated that the time necessary for hand disinfection with an alcohol gel was only 25% of the time required for regular handwashing.¹⁶ Also, because alcohol-based hand antiseptics do not require plumbing or a sink, dispensers can be placed in convenient locations, without major expense being incurred. A second deterrent to compliance is irritant contact dermatitis as a result of the damaging effects of soaps and detergents. Rates of dermatitis may exceed 60% in health care workers who have to wash their hands more than 35 times per shift,¹⁷ which would include most dentists who follow present infection control guidelines. Concern about the drying effect of alcohol-based products has likely hindered their rapid adoption in North America; however, formulations of alcohol disinfectants containing emollients to prevent drying of the skin are now

available. A randomized crossover study comparing soap and alcohol gels showed that the gels were associated with significantly *less* skin irritation and dryness, as assessed by both subjective and objective measures.¹⁸ Finally, data are beginning to accumulate to show that the introduction of alcohol-based hand antiseptics produces a sustained improvement in compliance with hand hygiene. Pittet and others showed that, after introduction of an alcohol-based hand disinfectant at a university hospital in Geneva, compliance with hand hygiene increased from 48% to 66%; they also found that this improvement was sustained.¹⁹ Bischoff and others found that providing alcohol gels at the bedside improved compliance with hand hygiene guidelines.²⁰

A few caveats should be considered in the use of alcohol-based products. When the hands have been significantly contaminated by blood or body fluids, regular handwashing should be performed. This should rarely be the case in dental practice, where gloves are worn for all patient contacts. Second, the alcohol-based product should contact all surfaces of the hand and fingers. Most dispensers produce approximately 1 mL of product, so those with larger hands may require more than one pump. Larson and others showed that 1 mL of alcohol-based product was significantly less effective than 3 mL; however, there is no evidence that this difference was clinically significant.²¹

Conclusion

Alcohol-based hand disinfectants should be considered an adjunct to handwashing in the dental clinic. These agents have a number of advantages over traditional soaps: they are more effective at disinfection, they require a shorter contact time, and they are less likely to cause dermatitis. The improvement in compliance with hand hygiene recommendations associated with the use of alcohol-based products will decrease the risk of transmission of infection in the dental setting. ♦

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