

COMMENTARY

Reexamining Methods and Messaging for Hand Hygiene in the Era of Increasing *Clostridium difficile* Colonization and Infection

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(See the article by Jabbar et al, on pages 565–570.)

There is little question that use of alcohol-based hand rub (ABHR) as the primary mode of hand hygiene in healthcare settings, which is strongly encouraged by the Centers for Disease Control and Prevention and the World Health Organization, has increased adherence to recommended hand hygiene practices worldwide. Compared with use of soap and water, use of ABHR requires less time, irritates hands less, and is possible at the patient bedside more often.^{1,2} Although ABHR has excellent germicidal activity against a broad spectrum of bacteria and viruses, including multidrug-resistant pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* species, ABHR is not efficacious against spore-forming organisms, such as *Clostridium difficile*.³ The 2009 World Health Organization guidelines accommodate this discrepancy in ABHR efficacy by recommending hand washing with soap and water for visibly soiled hands or “if exposure to potential spore-forming organisms is strongly suspected or proven, including outbreaks of *C. difficile* [infection]”^{4(p160)}; for all other situations, the guidelines recommend use of ABHR as the preferred means of routine hand hygiene in healthcare facilities. As *C. difficile* infection rates increase in the United States, many healthcare facilities have begun encouraging the routine use of soap and water for the care of all patients with active *C. difficile*-associated diarrhea. However, experts and clinicians have expressed concern about the patient- and situation-specific nature of the recommendations; they fear that inconsistency in hand hygiene messaging could potentially discourage ABHR use, which could plausibly decrease the frequency with which healthcare personnel perform hand hygiene when indicated.^{5,6}

In this issue of the journal, Jabbar et al⁷ confirm that hand washing with soap and water demonstrates efficacy superior to that of ABHR use in reducing *C. difficile* spore counts on hands. Furthermore, the authors report that *C. difficile* spores were readily transferred through hand-to-hand contact sub-

sequent to hand hygiene with ABHR. The study enlisted 10 volunteers who cleansed their hands with nonmedicated soap and water before inoculation of the palm with a 100- μ L *C. difficile* spore suspension of 500,000 colony-forming units (CFU). Volunteers then performed a 15-second bipalmar hand rub and a 3-minute air dry. A postinoculation stamp for culture was performed before volunteers cleansed their hands with 1 of 5 agents: 5 mL of chlorhexidine gluconate soap (Hibiclen) and water, 2 mL each of 1 of the 3 ABHR products, or water only (control). Immediately after hand hygiene, a post-hand hygiene stamp for culture was performed to assess the log reduction in spore concentration for the 4 hand hygiene products tested relative to the water control. For chlorhexidine soap and only 1 of the 3 ABHR products, log reductions in residual spore concentrations on hands were significantly greater than log reductions with the water control; chlorhexidine soap and water showed significantly greater log reductions, compared with all 3 ABHR products.

The article by Jabbar et al⁷ follows a recent article by Oughton et al⁸ in which similar conclusions were drawn: use of ABHR did not produce statistically significant log reductions in spore concentration, compared with no hand hygiene at all, and washing with either antimicrobial or plain soap demonstrated significantly greater reductions in spore concentration than did use of ABHR. The articles by both Oughton et al⁸ and Jabbar et al⁷ represent in vivo studies that confirm in vitro findings about the superior efficacy of washing with soap and water, compared with the efficacy of using ABHR, for the purpose of eliminating *C. difficile* spores.⁸

These studies relay a clear message: the efficacy of washing with soap and water is superior to that of using ABHR for eliminating *C. difficile* spores from hands. Hospital administrators and infection control personnel, however, must set hand hygiene policies that consider *C. difficile* infections as well as other healthcare-associated infections. Recommending that healthcare personnel use soap and water for patients with

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C. difficile colonization or infection while continuing to use ABHR for all other routine hand hygiene indications seems reasonable, given the findings of Oughton et al⁸ and Jabbar et al.⁷ But the context and potential unintended consequences of this recommendation should also be considered. For these recommendations to be maximally effective, the following assumptions must be true: (1) patients who are likely to shed *C. difficile* spores can be reliably identified, (2) discouraging ABHR use for patients with *C. difficile* colonization or infection will not discourage its use for all other routine hand hygiene indications, and (3) the comparative efficacy of washing with soap and water versus using ABHR that has been demonstrated in experimental settings is relevant to effectiveness in clinical practice. A critical analysis of each of these assumptions provides a framework for improving practices and identifying research gaps.

ASSUMPTION 1: PATIENTS WITH *C. DIFFICILE* COLONIZATION CAN BE RELIABLY IDENTIFIED

Recent reports emphasize that *C. difficile* often contaminates the skin and immediate patient care environment of patients who do not have active diarrhea, including patients who have recently recovered from *C. difficile*-associated diarrhea and patients who are colonized with the organism but have no history of related diarrhea.^{9,10} Patients with active diarrhea have higher rates of skin and environmental contamination and are a more important epidemiologic risk for transmission than patients who are only colonized with *C. difficile*, leading to the recommendation of isolating patients only for the duration of diarrhea.¹¹ Nonetheless, asymptomatic colonized patients do contribute to *C. difficile* transmission, and especially in long-term care settings, such patients may constitute a significant proportion of all patients.¹² This situation presents problems for healthcare personnel who are trying to implement hand hygiene recommendations on the basis of potential exposure to *C. difficile* spores.

ASSUMPTION 2: DISCOURAGING ABHR USE FOR SPECIFIC SITUATIONS WILL NOT DISCOURAGE ABHR USE FOR OTHER SITUATIONS

Installation of ABHR dispensers in patient care areas has resulted in significant and sustained increases in hand hygiene adherence. A recent review of the role of hand hygiene improvement in the prevention of healthcare-associated infection cited more than 20 studies from 1977 through 2008 that documented an association between increased hand hygiene adherence and decreased rates of healthcare-associated infection; nearly all interventions since 2000 included the introduction or expansion of the use of ABHR in healthcare facilities.¹³ Although the use of ABHR increased after 2000,

a recent 6-year multicenter trend analysis of soap use versus ABHR use in 137 intensive care units across the United States demonstrated that healthcare workers used proportionally less ABHR in 2008 and 2009 than in previous years.¹⁴ The increase in the incidence and severity of *C. difficile* infection coincided chronologically with the increased use of ABHR, which has led some people to posit a causal association between ABHR use and *C. difficile* transmission. However, 5 longitudinal studies have demonstrated no association between ABHR use and the incidence of hospital-acquired *C. difficile* colonization or infection.^{6,15-17} Four of these studies evaluated the association between ABHR use and rates of MRSA colonization or infection, and 3 demonstrated a significant reduction in rates of hospital-acquired MRSA colonization or infection that was associated with increased ABHR use. Thus, longitudinal studies do not support a causal role for increased use of ABHR in the increased rates of *C. difficile* colonization or infection, but they do highlight the benefits of increased hand hygiene adherence in decreasing rates of colonization or infection with other important hospital-acquired pathogens.

ASSUMPTION 3: EXPERIMENTS REFLECT CLINICAL PRACTICE

The finding by Jabbar et al⁷ that *C. difficile* spores could be transferred by means of a handshake (with an efficient transfer rate of 30%) immediately after ABHR use is compelling and concerning, particularly because healthcare workers can readily acquire *C. difficile* spores after contact with culture-positive patients (eg, in 1 study, 59% of healthcare workers acquired *C. difficile* spores after contact with culture-positive patients¹⁸). However, the inoculum (500,000 CFU) that was used to test this transfer was several orders of magnitude greater than the levels of hand contamination seen in clinical practice; the authors used a high inoculum "to yield a sufficient number of CFU to be counted in postdecontamination cultures and to show a difference between tested products." Although this level of contamination may be expected in stool samples, it is not realistic for routine contamination of hands after contact with patients with *C. difficile* colonization or infection. Healthcare personnel who care for patients with known *C. difficile* colonization or infection wear gloves,¹¹ which means that *C. difficile* contamination on hands, if present at all, may be so low that transfer to another hand or surface would not be clinically meaningful. There are no data demonstrating an incremental effect of hand hygiene after glove use (with either soap and water or ABHR) on *C. difficile* transmission in vivo. In addition, recent research suggests that washing with water and commonly used soaps may be no more effective than washing with water alone for removal of *C. difficile* spores, suggesting that these spores may adhere to the skin better than do other similar-sized organic particles.¹⁹

CONCLUSIONS

In conclusion, we advocate a continual examination of this issue, particularly as the epidemiology of *C. difficile* evolves and as more healthcare facilities attempt to actively prevent its spread. Although the well-executed work by Jabbar et al⁷ and Oughton et al⁸ cautions us about the poor efficacy of ABHR use against *C. difficile*, we must keep in mind the tremendous gains in hand hygiene adherence that are attributable to ABHR use, as well as its superior efficacy against other important pathogens. Considering the current state of the science with regard to *C. difficile* epidemiology and prevention, we support recommendations to wash hands when visibly soiled or when contact with *C. difficile* is suspected in outbreak or highly endemic settings, while continuing to encourage ABHR use as the preferred means of hand hygiene in all other circumstances. The efficacy of currently available products against diverse and emerging *C. difficile* strains should be closely examined in clinically realistic scenarios. Facilities should also emphasize strict adherence to contact precautions for patients with active *C. difficile*-associated diarrhea, appropriate and thorough environmental cleaning, and judicious antimicrobial use. We must ensure that as we reach for a comprehensive approach in the prevention of *C. difficile* transmission, we do not take a step backward in our efforts to prevent transmission of other epidemiologically important pathogens.

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