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Adoption of Alcohol-Based Handrub by United States Hospitals: A National Survey

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Abstract

The extent to which the use of alcohol-based handrub for hand hygiene has been adopted by US hospitals is unknown. A survey of infection control coordinators (response rate, 516 [72%] of 719) revealed that most hospitals (436 [84%] of 516) have adopted alcohol-based handrub. Leadership support and staff receptivity play a significant role in its adoption.

Holmes and Semmelweis demonstrated that contamination of the hands of healthcare workers (HCWs) played a major role in the transmission of pathogenic bacteria to patients.¹ Despite a call by international authorities that hand hygiene be conducted by all clinical staff to enhance patient safety, the rate of hand hygiene adherence remains suboptimal.^{2,3} Not surprisingly, numerous hand hygiene products have been evaluated to enhance the rate of hand hygiene compliance among HCWs, including plain soap, alcohol-based antiseptics, chlorhexidine, hexachlorophene, iodine and iodophors, para-chloro-meta-xyleneol, quaternary ammonium compounds, and triclosan.^{2,4} Perhaps the most promising is the use of alcohol-based handrub, which has been shown to be effective in reducing the number of pathogens on HCWs' hands.^{5,6} Although randomized controlled trial evidence is lacking, quasi-experimental studies suggest that the use of alcohol-based handrub—along with a comprehensive hand hygiene campaign—leads to increased rates of compliance with hand hygiene and reduced rates of infection with methicillin-resistant *Staphylococcus aureus*.^{7–9}

Despite recommendations that alcohol-based handrub be used,^{2,3} no nationally representative data surveyed the adoption of this recommended practice. Therefore, we evaluated the extent to which the use of alcohol-based handrub has been adopted by acute care hospitals across the United States. We were also interested in whether its adoption was associated with various organizational attributes, such as affiliation with an academic center, presence of an infection control committee, and leadership support in adopting evidence-based infection control practices.

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methods

Study sample

Our study sample and survey methodology have been described elsewhere.¹⁰ In brief, a survey was mailed to infection control coordinators at 119 Veterans Affairs (VA) medical centers and a stratified random sample of 600 non-VA hospitals across the United States, from March 16 through August 1, 2005. The non-VA sample was stratified by the number of beds (51–250 or more than 250), with 300 hospitals randomly chosen from each stratum.¹⁰ The study was approved by the institutional review board of the VA Ann Arbor Healthcare System.

Study measures

Our main outcome measure was a dichotomous variable indicating adoption of the use of alcohol-based handrub for hand hygiene by acute care hospitals in the United States. This variable was derived from a survey question: “Using a scale from 1 to 5 (1 being ‘never’ and 5 being ‘always’), please indicate how frequently the practice [alcohol-based handrub] is used in your facility.” Adoption (coded 1) was defined as receiving a rating of 4 or 5, while a rating of 1, 2, or 3 was coded as 0. Importantly, we assessed whether alcohol-based handrub was adopted for use in the hospital rather than the extent to which it was actually used prior to or after patient contact by individual HCWs.

We were also interested in the role of an infection control committee and leadership support for infection prevention and control–related activities in the adoption of this innovation. Our independent variables, therefore, included characteristics of the facility’s infection control program, including presence of an infection control committee (coded “yes” or “no”), whether the facility had a hospital epidemiologist (coded “yes” or “no”), as well as the absolute number of fulltime equivalent infection control professionals. Participation in a collaborative was measured as a “yes” response to the question “Are you a member of some type of collaborative effort to reduce healthcare infections?” Academic affiliation was defined as having an American Hospital Association–approved residency program.

To assess the effect of leadership involvement in the adoption of infection prevention practices, such as the use of alcohol-based handrub for hand hygiene, we asked respondents to indicate their level of agreement with statements about the perceived ease of adopting infection control recommendations (Question: “In general, it is very easy in my hospital to implement evidence-based recommendations to prevent healthcare-associated infections”), about leadership support in implementing evidence-based infection control recommendations (Question: “I feel that I generally receive a great deal of support from the leaders of my hospital when I want to implement an evidence-based recommendation to prevent healthcare-associated infections”), and about whether leadership rewarded clinical innovation and creativity in patient care (Question: “Senior leadership and/or clinical management in my hospital reward clinical innovation and creativity to improve patient care”). These questions were adapted from other survey instruments or specifically designed for this study, and they were included as part of the survey following extensive pretesting. Each of the questions used a response scale ranging from 1 (strongly agree) to 5 (strongly disagree). However, the variables were reverse coded for the analysis, so a higher score indicates a stronger level of agreement. We selected these questions for this analysis on the basis of our a priori hypothesis that leadership involvement is critical in the adoption of the use of alcohol-based handrub.

Statistical analyses

All data were analyzed using Stata, version 9.0 (StataCorp). Bivariable associations between independent variables and our main outcome were determined using a Pearson χ^2 test. The level of significance was set at .05. Multivariable analyses were performed using sample

weights, based on the probability of selection, to reflect the total population of hospitals represented by the respondent sample. We constructed weighted logistic regression models to examine the associations between the leadership support variables and the adoption of the use of alcohol-based handrub, after adjusting for other potential confounders, such as the presence of a hospital epidemiologist, infection control professional certification, the number of intensive care unit beds, the total population, and the metropolitan location. Results from the multivariable analyses are reported as odds ratios (ORs) with 95% confidence intervals (CIs).

RESULTS

Of 719 surveys mailed, 516 (72%) were returned; 95 (80%) of 119 surveys mailed to VA hospitals were returned, and 421 (70%) of 600 surveys mailed to non-VA hospitals were returned. Most respondents (436 [84%] of 516) reported that alcohol-based handrub was adopted for use in their facility. Adoption of this practice was nearly universal across hospitals, regardless of hospital type, medical school affiliation, presence of an infection control committee or a hospital epidemiologist, or participation in a quality improvement collaborative (Table 1). For example, 82 (86%) of 95 VA hospitals and 354 (85%) of 416 non-VA hospitals reported the adoption of the use of alcohol handrub; so did 415 (86%) of 483 facilities with an infection control committee and 21 (75%) of 28 facilities without an infection control committee. This adoption was widespread across other infection control program characteristics, such as the presence of a hospital epidemiologist, as well as the number of full-time equivalent infection control professionals.

We were also interested in the adoption of an infection control innovation within an environment of leadership support and ease of adopting infection control recommendations (Table 2). We found that the likelihood of a facility's adopting the use of alcohol-based handrub for hand hygiene was significantly and positively associated with stronger agreement that it was easy to implement evidence-based recommendations at their hospital (OR, 1.56 [95% CI, 1.14–2.12]; $P = .005$). Adoption of the use of alcohol-based handrub was also more likely in facilities with increased levels of agreement that leadership rewards clinical innovation (OR, 1.55 [95% CI, 1.15–2.10]; $P = .004$) and staff are receptive to change (OR, 1.59 [95% CI, 1.14–2.21]; $P = .006$).

DISCUSSION

The extent to which evidence-based healthcare innovations are adopted and implemented by healthcare organizations, physician groups, and individuals varies tremendously. Some innovations are never adopted, while others remain only partially adopted; a few become fully integrated into clinical practice. The way that potential adopters perceive key attributes of the innovation helps explain much of this variation in adoption rates.¹¹ Innovations that are clear, simple, compatible with organizational structure, and unequivocal in their effectiveness are more easily adopted. An innovation with a visible, measurable benefit that also improves task performance is also more likely to be universally adopted.¹²

The practice of using alcohol-based handrub for hand hygiene has been accepted with little discussion or controversy. Our study, using a nationally representative sample of US hospitals, revealed that the use of alcohol-based handrub has been widely adopted, regardless of academic or VA affiliation, participation in a collaborative, presence of a hospital epidemiologist, or number of infection control professionals at a given hospital. The use of alcohol-based handrub has been shown to enhance hand hygiene compliance in several studies and to reduce rates of infection with methicillin-resistant *Staphylococcus aureus* in Europe and Australia.^{2,6,7} While no randomized controlled trials have proven that this innovation reduces the rate of infection in American hospitals, the use of alcohol-based handrub carries several characteristics of an

ideal innovation. First, the use of alcohol-based handrub appears to have a clear and unambiguous advantage in enhancing hand hygiene practices among HCWs, a practice plagued by poor compliance. Second, the use of alcohol-based handrub is a “compatible” innovation with respect to the norms and values of hospitals and HCWs. All healthcare facilities strive to enhance patient safety by increasing hand hygiene adherence. Third, it is a relatively simple innovation and perceived as a time-saver. Moreover, the use of alcohol-based handrubs is straightforward to implement and apparently poses little risk to users.

Leadership support and commitment to adopting and implementing evidence-based recommendations are often crucial, particularly for innovations that require organization-wide deployment. Consistent with this observation, we found that the probability of a facility adopting the use of alcohol-based handrub was positively associated with increased agreement that leadership is supportive and rewards clinical innovation. On the other hand, external factors, such as inspections from regulatory agencies, can act as a barrier to adoption of innovations. For example, placement of alcohol-based handrub dispensers in egress hallways led to objections during local fire marshal inspections that they may pose a fire hazard.¹³ However, with leadership support, staff support, as well as recommendations from major societies, most facilities appear to have overcome such obstacles.

A few study limitations must be acknowledged. This study is based on self report and, hence, carries the potential for respondent bias. Assurance of confidentiality may have reduced this bias. Nonresponse bias is also a concern for mail-in surveys. However, our excellent response rate lessens concerns about the generalizability of the results. Finally, we focused on the adoption of the use of alcohol-based handrub at an organizational level rather than on the actual use of this innovation in daily clinical care by HCWs. Therefore, we could explore associations between predictor variables and adoption of this practice rather than actual use before or after patient contact. Choices made by HCWs pertaining to different products used for hand hygiene were not evaluated in this study; we focused on institutional practices, instead.

Limitations notwithstanding, our national survey provides a point of reference for the adoption of the use of alcohol-based handrub in American hospitals. Even without evidence from randomized controlled trials, the use of alcohol-based handrub has achieved widespread adoption in American hospitals. Acceptance of this innovation was likely facilitated by supportive leadership and staff receptivity to change, coupled with the relative simplicity of using alcohol-based handrub.

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TABLE 1

Hospital Characteristics and Rates of Adoption of Alcohol-Based Handrub as Reported in the Study Survey

Hospital characteristic	Adopted alcohol-based handrub	<i>P</i>
Hospital type		
VA	82/95 (86)	
Non-VA ^a	354/416 (85)	.76
Academic affiliation with approved residency program		
Yes	165/194 (85)	
No	270/316 (85)	.90
Presence of infection control committee		
Yes	415/483 (86)	
No	21/28 (75)	.11
Participation in quality improvement collaborative		
Yes	183/211 (87)	
No	247/294 (84)	.40
Presence of hospital epidemiologist		
Yes	193/226 (85)	
No	233/272 (86)	.93
No. of infection control professionals		
<1 FTE position	69/82 (84)	
1–2 FTE positions	276/328 (84)	
2.1–4 FTE positions	52/58 (90)	
>4 FTE positions	13/13 (100)	.32

NOTE. Data are proportion (%) of hospitals. Denominators vary because not all questions were answered by all respondents. FTE, full-time equivalent; VA, Veterans Affairs.

^aFive of the 421 responses were missing data on alcohol-based handrub and were eliminated.

TABLE 2

Factors Associated with Regular Use of Alcohol-Based Handrub for Hand Hygiene as Reported in the Study Survey

Statement	OR ^a (95% CI)	P
Leadership support		
It's easy to implement evidence-based infection control recommendations	1.56 (1.14–2.12)	.005
Leadership supports implementation of infection control recommendations	1.36 (0.99–1.87)	.059
Leadership rewards clinical innovation	1.55 (1.15–2.10)	.004
Staff receptiveness		
Staff members are receptive to change	1.59 (1.14–2.21)	.006

NOTE. Regular use (coded 1) is defined as receiving a rating of 4 or 5 on a scale of 1 to 5 (with 1 being “never” and 5 being “always”). Five responses were missing data on alcohol handrub use and were eliminated. CI, confidence interval; OR, odds ratio.

^aResults adjusted for academic affiliation, presence of hospital epidemiologist, Infection Control Professional certification, the number of intensive care unit beds, the total population, and the metropolitan location.