Improving Hand Hygiene Compliance By Incorporating It Into the Verification Process in the Operating Room

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Citation

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Abstract

Background: Universal compliance with hand hygiene is fundamental to reduce infections, patient mortality, and health care costs. Since compliance is known to be poor, we implemented and evaluated two interventions to improve compliance in the operating room setting.

Objective: We aimed to determine the compliance of hand washing in our operating room before and after implementing two process-improvement interventions. Our hypothesis was that these interventions would change the behaviors and ultimately increase the compliance among operating room personnel in using the alcohol-based hand sanitizers while entering and exiting the operating rooms.

Methods: We randomly observed 1000 encounters of operating room personnel using the alcohol-based hand sanitizers while both entering and exiting the operating rooms in a university tertiary care center. Two distinct interventions to promote hand hygiene were implemented. Intervention A: displaying signs in strategic areas throughout the operating rooms. Intervention B: including hand hygiene in the time-out/verification process. Interventions were separated by 5 months.

Results: We found that: A) the baseline compliance rate of utilizing the alcohol-based hand foam prior to any intervention was 7.6%; B) after Intervention A, the compliance rate increased to 11.2% ($p=0.0511$) and decreased to 10.4% after 5 months; C) after Intervention B, the compliance rate significantly increased to 70.8% ($p<0.0001$).

Conclusions: The results of our study clearly show that the compliance rate of utilizing the alcohol-based hand sanitizers was poor and that interventions with clearly accountable results changed the behaviors and ultimately increased the compliance among operating room personnel. We conclude that incorporating hand hygiene into the time-out process is an effective process improvement intervention that boosts compliance of hand hygiene. This process improvement intervention may help reduce perioperative infection rates, mortality, and overall healthcare expenditures.

INTRODUCTION

Our largest organ system, the human skin, is composed of four distinct layers, each having its own physiologic purpose and function. The outermost layer, the stratum corneum, is composed of a tough horny layer of keratin that serves as the primary barrier against water and heat loss, pathogens, and other foreign bodies from entering our system. However, as much as this layer is designed to protect its host it also provides a reservoir rich in bacterial flora that can promote pathogen cross-contamination between healthcare workers and patients.

The prevention of cross contamination with hand hygiene has been known since the mid-1800s. Its significance, however, was not universally appreciated until 1843 when Oliver Wendell Holmes recognized the role of transmission of contagions on the hands of physicians in the spread of puerperal fever.1 In addition, Joseph Lister identified the importance of antisepsis with carbolic or phenic acid in the practice of surgery2 Furthermore, the actual impact of hand hygiene on infection rates was indeed first demonstrated in 1847 by Ignaz Semmelweis when he remarkably demonstrated the effectiveness of hand hygiene in reducing postpartum maternal mortality from a high of 18.97% to about 3%.3

Today, healthcare workers are generally complacent about following hand hygiene practices. As few as 5% of health care workers comply with the fundamentals of hand hygiene practices.4 In fact, in an observational study, Pittet et al.

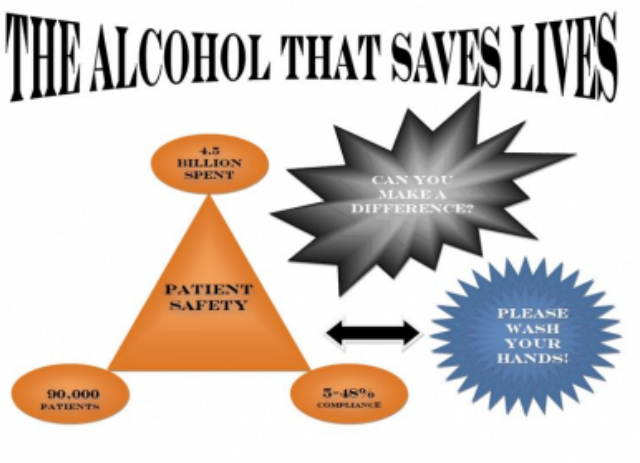
showed that physicians in a teaching hospital were less compliant with hand washing than other healthcare workers.5 Furthermore, Pittet et al. found that the average compliance rate with hand washing was only 48%.5 This lack of hand hygiene has been shown to contribute to the risk of infection.6 Furthermore, central line-associated blood stream infections have been linked with prolonged length of hospital stay, increased morbidity and mortality, and increased healthcare costs.7 Cumulatively, health care-associated infections contribute to the mortality of 90,000 hospitalized patients annually and an overwhelming $4.5 billion dollars in additional healthcare costs.8 Improvements in health care providers' education9, patient education10, and performance feedback11 have been developed to improve the practice of hand hygiene, but with only transient improvement of hand hygiene compliance rates. Therefore, since hand hygiene compliance is known to be poor, we aimed to determine the compliance of hand hygiene in our operating room setting and after implementing two different interventions aimed to improve compliance. Our hypothesis was that interventions with clearly accountable results would change the behaviors and ultimately increase the compliance among operating room personnel in using the alcohol-based hand sanitizers while entering and exiting the operating rooms. The implications of this study are important because our results could provide the rationale to recommend across the board the adoption of this process-improvement intervention to help reduce perioperative infection rates, mortality, and overall healthcare expenditures.

DESIGN AND METHODS

The study was conducted throughout our 20 operating rooms and 8 surgical suites at the University of Illinois Hospital & Health Sciences System, a 495-bed university tertiary care institution, after receiving approval by the Institutional Review Board. All operating room personnel were eligible for observation via random sampling. The principal investigator and co-investigator collected the data and did not record any protected health information. We recorded 1000 observational encounters from February to August 2013. Initially, we observed and gathered baseline data regarding the compliance of operating room personnel using the alcohol-based hand sanitizers while entering and exiting the operating rooms and surgical suites. We then implemented two distinct interventions to promote hand hygiene awareness and improve compliance. Intervention A (Sign Group) consisted of displaying signs (see Figure 1) in proximity to operating room doors and alcohol-based hand sanitizers throughout the operating rooms and surgical suites. Five months later, we reassessed the compliance rate to determine the degree of retention of Intervention A. At that time, we also implemented intervention B (Time-out Group), which consisted of incorporating the use of the alcohol-based hand sanitizers into the time-out/verification process. Prior to the implementation of intervention B, the Director Surgical Services educated the operating room nurses to include hand hygiene in the time-out process, and an e-mail was sent to all operating room staff regarding the addition of hand hygiene to our time-out/verification process in the operating room. Our verification process included the following: introductions of individuals in the operating room; patient's name and date of birth; consent verification of patient's procedure, site and laterality; antibiotics needed; correct implant and equipment available; estimated blood loss/blood products needed; whether the patient is on beta blockers; whether the patient has a(n) difficult airway/aspiration risk; and the assessment of fire risk. Specifically, during the time-out, participants were also asked whether they "foam in and foam out" or washed their hands. If participants were not compliant with hand hygiene, they would leave the room, utilize the alcohol-based hand sanitizer, and then return to the operating room or surgical suite. Observations and data collection of compliance of operating room personnel using the alcohol-based hand sanitizers while both entering and exiting the operating rooms and surgical suites were recorded before and after each intervention.

Figure 1

Intervention A: Sign displayed in proximity to operating room doors and alcohol-based hand sanitizers throughout the operating rooms and surgical suites



STATISTICAL ANALYSIS

Results were reported as percentages for categorical variables. We compared compliance rates prior to interventions as well as before and after Intervention A (Sign Group) and Intervention B (Time-out Group). The chi-square test was utilized to compare the compliance rates statistically between the Sign and Time-out Groups.

Statistical analyses were conducted using SAS software, Version 9.2 of the SAS System for Windows. Copyright © 2008 SAS Institute Inc., Cary, NC, USA. Significance was set at $p \leq 0.05$. The end-point outcome was defined as compliance with regards to using the alcohol-based hand sanitizers while both entering and exiting the operating rooms and surgical suites.

RESULTS

In our operating room setting and surgical suites, the baseline compliance rate of utilizing the alcohol-based hand sanitizers was 7.6%.

After displaying signs in strategic areas throughout the operating rooms and surgical suites (Intervention A-Sign Group) the compliance rate rose from 7.6% to 11.2%. This increase, shy of statistical significance ($p=0.0511$), indicates that the compliance rate of Intervention A was almost similar to baseline.

Five months after implementing Intervention A, the compliance rate of utilizing the alcohol-based hand sanitizers decreased from 11.2% to 10.4%. After incorporating the use of the alcohol-based hand sanitizer into our time-out/verification process (Intervention B-Time-out Group), the compliance rate significantly increased from 10.4% to 70.8% ($p<0.0001$).

DISCUSSION

The results of our study clearly show that the compliance rate of utilizing the alcohol-based hand sanitizers was poor and that interventions with clearly accountable results changed the behaviors and ultimately increased the compliance among operating room personnel. In fact, compliance with hand hygiene increased 60% after incorporating hand hygiene into our time-out/verification process rather than simply displaying signs throughout the operating rooms area.

Compliance with hand hygiene among health care workers is known to be poor 4 and our baseline observations confirm this fact but do not provide the reasons of such a poor compliance. We know that barriers to hand hygiene have been reported in the literature as contributing to the low compliance rate of hand hygiene in health care institutions. For instance, Pessoa-Silva et al. reported that dermatitis, a preference to using gloves, and forgetting to practice hand hygiene were the most common reasons given for not complying with hand hygiene. Other reasons cited for poor compliance were the lack of time and the unavailability of hand hygiene solutions.12 To reduce the incidence of dermatitis in order to improve hand hygiene, hand hygiene solutions have been enhanced with emollients with great success. Larson et al. reported that the use of alcohol-based hand rubs with emollients resulted in less skin irritation and “similar microbial effectiveness and improved condition of critical care staff”.13 Aware of this issue, our institution has provided hand lotions to aid with reducing skin irritation. Another reason cited for poor compliance by Pessoa et al. was that health care workers prefer to wear gloves rather than practice hand hygiene.12 While gloves do provide a barrier and reduce transmission of pathogens, wearing gloves during patient contact does not completely prevent contamination of hands. Olsen et al. reported a 13% microbial contamination of health care workers hands despite wearing gloves.14 Therefore, wearing gloves is not considered an alternative to practicing hand hygiene and process improvement interventions should be directed to increasing compliance to practice hand hygiene.

The results of our study also showed that process improvement interventions with clearly accountable results changed the behaviors and ultimately increased the compliance among operating room personnel. In fact, displaying signs in proximity to operating room doors and alcohol-based hand sanitizers throughout the operating rooms and surgical suites had just a modest increase in compliance, though with a high degree of retention. The reasons of this effect are unclear. Nevertheless, incorporating the use of the alcohol-based hand sanitizers into the time-out/verification process is a process improvement intervention with clearly accountable results that boosted the compliance rate with hand hygiene sixty percent when compared to the sign-only intervention. We believe that the reasons of this increased compliance rest in the individual accountability of the process. In fact, we deliberately chose to incorporate hand hygiene into the time-out process since the time-out process is a well-established practice mandated by Joint Commission that is performed

prior to a procedure and that has high compliance rates.15-18 This no-cost process-improvement intervention can be implemented hospital-wide with no required special instruments or tools. However, incorporating hand hygiene into the time-out/verification process requires the support of the administration and the institution in promoting a culture of patient safety. Unlike other interventions, such as the sign-only, this intervention incorporates hand hygiene into an already established procedure that operating room personnel are familiar with and that does not require special equipment or additional financial resources.

Our study has some limitations. We cannot rule out a Hawthorne effect to explain the increase in compliance. The Hawthorne effect has been recognized and associated with higher rates of hand hygiene compliance.19 However, during our investigation we were obscure observers attempting to avoid the Hawthorne effect. Another limitation to our study is that we did not identify individual subjects to record pre- and post- data for each individual subject. However, we feel that our results are reflective of the overall behavior of our operating room personnel.

In conclusion, we have shown that compliance with hand hygiene significantly increased after incorporating hand hygiene into our time-out/ verification process in our operating rooms. Our results could provide the rationale to recommend across the board the adoption of this process-improvement intervention to help reduce perioperative infection rates, mortality, and overall healthcare expenditures. For this reason, further studies to address the impact of this intervention on infection rates, mortality, and healthcare costs can be considered.

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Authors Conflict of Interest: None

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