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Brief report

Hand sanitizer-dispensing door handles increase hand hygiene compliance: A pilot study

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Improving rates of hand hygiene compliance (HHC) has been shown to reduce nosocomial disease. We compared the HHC for a traditional wall-mounted unit and a novel sanitizer-dispensing door handle device in a hospital inpatient ultrasound area. HHC increased 24.5%-77.1% ($P < .001$) for the exam room with the sanitizer-dispensing door handle, whereas it remained unchanged for the other rooms. Technical improvements like a sanitizer-dispensing door handle can improve hospital HHC.

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Increasing hand hygiene compliance (HHC) has been shown to decrease rates of nosocomial disease.¹⁻³ Although adoption of waterless hand sanitizer dispensers has led to increased HHC, the ultimate goal of universal compliance has not been reached. A 2009 multicenter study⁴ assessing hand hygiene (HH) found a baseline compliance of 26% in intensive care units (ICUs) and 36% in non-ICU settings.

Bischoff et al⁵ demonstrated that technical improvements can increase HHC. In that study, an education/feedback program coupled with sink and soap handwashing failed to improve HH. However, HHC increased (23%-48%) following the introduction of an easily accessible alcohol-based waterless sanitizer dispenser.⁵⁻⁶ The authors concluded that the higher HHC was driven by the improvement in access to and the ease of use achieved with the dispenser. Similarly, other researchers have looked at a multitude of factors that affect ease of access and thus can result in increased HHC. These factors include the ergonomics of resource placement⁷; proximity, cost, and staff acceptance⁸; device durability and maintenance⁹; and environment-specific customization.¹⁰

A novel hand sanitizer-dispensing device has become available on the market in which the agent-dispensing lever functions as a

doorknob. The device is installed on a door replacing the doorknob, and each time the door handle is used to open the door, waterless hand sanitizer is dispensed into the user's hand. In agreement with prior studies, this new device has the potential to increase HHC by minimizing barriers to handwashing.

We conducted a pilot study to determine the feasibility of use of a sanitizer-dispensing door handle, and to compare the HHC between the standard wall-mounted dispenser and the sanitizer-dispensing door handle. We hypothesized that HHC would improve with the implementation of a sanitizer-dispensing door handle.

METHODS

Our protocol was approved by the institutional review board.

This study was conducted over a 2-week period at 1 of our institution's hospital inpatient ultrasound locations composed of 3 examination rooms. A single water sink and soap dispenser and 4 wall-mounted hand sanitizers are available for HH in the clinical area. During week 1—the control week—baseline HHC rates for each exam room were determined. During week 2—the trial week—a sanitizer-dispensing door handle (TurnClean, Altitude Medical, Inc, Baltimore, MD) (Fig 1) was installed in 1 of the examination rooms, and compliance rates were reassessed for the trial room and the 2 control rooms.

The department personnel participated in a 20-minute training session to learn about the new device and practice using it before the trial week. Standard hospital-issued HHC signs were posted in the hallway outside of the examination rooms, but not on the exam room doors, during the control and trial weeks. During the trial

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The sanitizer-dispensing door handle used in this study was provided at no charge by Altitude Medical, Inc. Altitude Medical, Inc, was involved in study design but was not involved in data collection/analysis or manuscript writing/submitting.

L.S.B. and B.S. contributed equally to this study and to preparation of the manuscript.

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Fig 1. The sanitizer-dispensing door handle. Waterless hand sanitizer is nebulized onto a user's hand from the top of the handle.

week, a diagram depicting proper use of the sanitizer-dispensing door handle was placed on the trial room door. HHC was defined as using a wall-mounted hand sanitizer or the sink and soap before entering the examination room during the control week, and as using a wall-mounted sanitizer or sink and soap or the sanitizer-dispensing door handle during the trial week. Hourly HH rates were calculated based on the percentage of time a hand hygiene event occurred before entering a patient care area¹ for all exam rooms in use between 8 AM and 6 PM. Two alternating volunteers who were not known to the personnel were placed in an inconspicuous location to monitor HH while not altering behavior.

The door handle device works by nebulizing upward waterless hand sanitizer into a user's palm as the door handle is being turned to enter the room. The door handle device used the same waterless hand sanitizer as the wall-mounted units. Following application of the solution, the user was expected to rub the solution over all parts

Table 1

Hourly hand hygiene compliance (HHC) for the control and the trial week for all 3 ultrasound examination rooms

	Hourly HHC			
	Mean rate	Min rate	Max rate	Hand hygiene events
		%		n
Control week				
Room 1 (control)	21.8	0	42.9	181
Room 2 (trial)	24.5	0	66.7	304
Room 3 (control)	18.0	0	42.9	231
Trial week				
Room 1 (control)	14.8	0	38.4	180
Room 2 (trial)	77.1*	66.7	100.0	157
Room 3 (control)	12.2	0	42.9	99

*Statistically significant improvement in HHC between the control and the trial week.

of hand surfaces and nails—in the same manner as sanitizer from wall-mounted units. To avoid altering behavior, correct application of the solution was not confirmed by the volunteers monitoring the study. As a part of the clinic's workflow, health care practitioners are required to keep examination room doors closed when with a patient or between clinical encounters; however, this was not externally enforced.

Using a 2-tailed *t* test, the mean hourly HHC rates were compared for the trial room at baseline and the control rooms at baseline, the trial room and the control rooms during the trial week, the control rooms during the trial week and at baseline, and the trial room before and after the installation of the sanitizer-dispensing door handle. Significant difference was rated as $P < .05$.

RESULTS

The hourly HHC for the control and the trial week for all 3 ultrasound examination rooms is depicted in Table 1. The HHC rate in the trial room was not 100% because some staff left the exam room door open between the different patient encounters.

The mean hourly HHC rate was the same for the trial room and control rooms at baseline ($P = .19$), increased in the trial room compared with the control rooms during the trial week ($P < .001$), remained unchanged in the control rooms during the 2 weeks ($P = .11$), and increased in the trial room after the installation of the sanitizer-dispensing door handle (24.5% vs 77.1%; $P < .001$).

DISCUSSION

Similar to prior studies, we found suboptimal baseline HHC at our clinic.⁴ The introduction of a sanitizer-dispensing door handle led to a significant improvement in HHC—from 24.5% at the baseline measurement to 77.1% during use of the trial door handle. Our preliminary results demonstrate the feasibility of use of a sanitizer-dispensing door handle in a clinical setting as well as the resulting improved HHC. The improvement in HHC likely stems from the more integral incorporation of handwashing into the daily clinical workflow by making handwashing synchronous with door opening. This hypothesized explanation of the improved handwashing compliance is supported by prior literature that has demonstrated that ergonomics and proximity are important factors in HHC.^{7,8}

The goal of our pilot study was to conduct the initial assessment of a novel device. A more comprehensive trial is needed to fully determine the long-term benefit of a sanitizer-dispensing door handle above and beyond that of a traditional wall-mounted dispenser. Other factors such as personnel training level; personnel satisfaction of use; hospital ward acuity level; and the use of a specific cleaning agent, previously identified as having an

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