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Major article

Visitor characteristics and alcohol-based hand sanitizer dispenser locations at the hospital entrance: Effect on visitor use rates

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Background: Hospital visitors' hand hygiene (HH) is an important aspect of preventing health care-associated infections, but little is known about visitors' use of alcohol-based hand sanitizers (AHS). The study aim was to examine if use of AHS is influenced by visitor characteristics and the location of AHS within the lobby of a large hospital.

Methods: An observational study was conducted with AHS placed in 3 different locations. The data included visitor characteristics and if AHS were used.

Results: The results suggest that visitors are 5.28 times (95% confidence interval [CI], 3.68-7.82) more likely to use AHS when dispensers are located in the middle of the lobby with limited landmarks or barriers, 1.35 times more likely to use the AHS in the afternoon compared with the morning, or when they are younger visitors (adjusted odds ratio, 1.47; 95% CI, 1.09-1.97). Individuals in a group are more likely (adjusted odds ratio, 1.39; 95% CI, 1.06-1.84) to use AHS.

Discussion: In addition to location, time of day, and age, there is a group effect that results in visitors being more likely to use AHS when in a group. The increased use related to groups may serve as a mechanism to encourage visitor HH.

Conclusions: The results suggest future research opportunities to investigate the effect of group dynamics and social pressure on visitor AHS use and to identify strategies for improving visitor HH.

BACKGROUND

One of the most important and effective infection control measures to prevent the transmission of nosocomial pathogens in clinic settings is hand hygiene (HH).[1,2] Health care-associated infections have been traced back to patients, hospital employees, and visitors[3] and there have been numerous efforts to improve hand hygiene compliance (HHC) among health care workers (HCWs), but research regarding HH among hospital visitors remains limited.[4] In this context, "visitors" refers to individuals entering a hospital who are not hospital employees, patients, contractors, or delivery drivers who may enter the hospital. Visitors typically have numerous opportunities to sanitize their hands using 1 of the many alcohol-based hand sanitizers (AHS) located throughout the hospitals. Hospital policies typically encourage or require visitor HH when entering or exiting the rooms of patients who are highly susceptible or in critical care.[5] However, research documenting effective strategies and policies related to HH that target hospital visitors are largely unmonitored and unreported.[6]

Pittz[7] showed that <1% of visitors sanitized or washed their hands upon arrival to a hospital. Therefore, there is an opportunity to improve visitor HH when entering a lobby of hospitals using AHS.[7] Similarly, Wolfe and O'Neill[8] suggested that visual aids may influence visitors' use of AHS in different locations. They conducted a study in which they placed a large HH promotional unit along with additional signage encouraging HH on AHS that were located at the entrance of a hospital. The ward entrances had signs directing visitors to a single dispenser on each floor and all patient rooms had AHS outside the rooms but did not include promotional materials. Wolfe and O'Neill[8] also found that HH varied across locations with the highest use at the hospital entrance.

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Birnbach et al[4] conducted a study to improve visitor use of AHS in a main lobby by introducing and comparing 3 different interventions. These individually implemented interventions included placing a sign instructing all visitors that they must wash their hands at the security desk, placing an AHS dispenser next to the security desk with no signage, and placing an additional sign on top of the AHS dispenser (ie, combining the 2 interventions). The HH rate improved by 0.67% associated with the sign at the reception desk, 9.33% associated with moving the AHS, and 11.67% associated with using a combination of the methods.[4] This study provides additional evidence that the location of AHS within a hospital entrance may influence improving visitor HH.[4]

These studies show the low number of visitors who engage in HH upon entering a hospital. Other studies have evaluated the HH of visitors while on a floor were HH/isolation precautions are required such as the neonatal intensive care unit (NICU) or burn unit.[9-11] A study conducted in the medical, surgical, and intensive care units identified visitors, physicians, and orderlies as having lower methicillin-resistant *Staphylococcus aureus* compliance (which includes HH) compared with nurses.[12] Although the majority of these studies focused on HCWs, 1 study[10] specifically also included visitors to an NICU in an evaluation of an intervention but showed that there were not significant improvements in the visitor HH rates following the intervention. Thus visitors throughout the hospital warrant investigation as they relate to the risk of health care-associated infections.

In addition to the research about visitors, the location of HH equipment has been identified as an environmental barrier to HCW HHC.[13] Generally it has been shown that poor product placement lengthens the time it takes to perform the task and limited access to sanitation stations reduced an individual's access and opportunity to clean his or her hands.[14] Therefore, handwashing equipment placement for visitors needs to be considered when designing facilitates and appropriately located HH facilities are critical for visitor HH.[15] Additionally, it is important to consider the saliency of an AHS dispenser in terms of its visual contrast with the environment and also how the placement may introduce an unsafe barrier for individuals moving through the hospital hallways and entryways.

AHS location, signage, and other interventions (eg, social pressure) might influence hospital visitors' use of AHS and overall HH. Social pressure involves considering others' expectations of one's performance and adjusting performance according to these expectations.[16] For example, HH practice may be influenced by self-perception of what colleagues expect.[16] Social pressures have shown to have an influence on HCW HHC.[17] The perceived opinion of a supervisor or manager toward HH and the perception of locus of control over HH can predict the intention to perform HH among HCWs.[17] Although hospital visitors do not have an authority figure who might influence their behavior in this context, these studies suggest groups of visitors entering the hospital together may have an effect on AHS use rates within groups. Little research, if any, has been done on the effect of social pressure in conjunction with location of AHS on visitor HH. Therefore, the objective of our study was to explore how individual characteristics (eg, age and sex), individuals entering alone or as part of a group, and the location of AHS influence the visitor's likelihood of using AHS.

MATERIALS AND METHODS

This observational study was conducted in the lobby of the main visitor entrance of a 749-bed hospital. The AHS dispenser used in this study was a black unit on a black stand with no signage. Before beginning official observations, the lobby was monitored to determine observation arrangements (eg, developing data collection forms, identifying a location for the observer during the study). During these observations, the original location of the AHS had zero visitor use and was therefore not considered as a possible AHS location for the purpose of the research objectives. Three new locations were used and no other AHS were moved. The 3 locations were chosen based on an initial assessment of trends in the patient pathways throughout the main lobby, possible saliency of the AHS dispenser against lobby decor, and locations used in a similar study involving AHS placement.[4] Data were collected during a 3-week period by 2 observers. To minimize the Hawthorne effect, the observers were located in a visitor seating area facing the entrance of the hospital lobby with all AHS locations in view. An initial interreliability study was conducted to ensure consistent data collection between the 2 observers. If there were discrepancies in classification of the visitors, the differences were discussed to ensure consistency in the actual study observations. The observations were conducted on Monday, Wednesday, and Sunday for 2 time periods each day (10-11:30 a.m. and 4-5:30 p.m.). These times were chosen based on a similar study that suggested that those were the busiest times for visitors entering a hospital.[4] The positioning of the AHS dispenser was changed between the 3 locations so that each location was observed for 1 week, including each of the 6 observations periods. Figure 1 shows the layout of the entry and lobby area of the hospital. The arrows beside the AHS location indicate the direction the AHS was facing. Location 1 was centered straight ahead of the revolving doors (represented by the double doors in Figure 1) and had no landmark or barrier near the AHS. Location 2 was centered in front of the information desk. Location 3 was centered between the revolving door and the side door. The locations of the AHS are shown in Figure 1. Figure 1 also identifies Location 0, the original location of the AHS not included in the study and where the study observers were during the data collection periods.

A paper-based data collection tool was created and used during this study. For each visitor, the observer recorded the visitor's assumed sex, assumed age (categorized as a child, young adult, adult, or elderly), group status (binary; that is, in a group or alone), the size of the group, and whether each visitor used the AHS. A visitor was identified as an individual who was not a hospital employee (ie, not wearing scrubs or employee badges), a patient (ie, not wearing hospital gowns or patient bracelets), or working for an outside company entering the hospital wearing clothing or uniforms or carrying objects (eg, cab drivers, food delivery, or parcel delivery). The age of the visitors was estimated subjectively and the sex of visitors was assumed based on gender normative appearances. The entrance in this study was not generally used for hospital admissions. The study was determined to be exempt from human subjects by both the Greenville Health System and Clemson University institutional review boards.

A logistic regression model was used to predict the likelihood that a visitor used the AHS when entering the hospital compared with not using the AHS. The analysis was done in R 3.1.1 using the *glm* function (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Descriptive statistics

In total 6,603 visitors were observed entering the hospital during the study. Visitor use rates at location 1, 2, and 3 were 7.26%, 1.46%, and 2.53%, respectively (see Table 1 and Table 2).

Visitor characteristics affecting use include age, day of the week, and time of day. Children represented 7.6% of visitors, young adults represented 20.1% of visitors, middle-aged individuals represented 59.3% of visitors, and elderly persons represented 13.0% of the observed visitors. Comparing the day of the week resulted in