Do hospital visitors wash their hands? Assessing the use of alcohol-based hand sanitizer in a hospital lobby

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Infection prevention

Background: Reports regarding hand hygiene compliance (HHC) among hospital visitors are limited. Although there is an implicit assumption that the availability of alcohol-based hand sanitizer (AHS) promotes visitor HHC, the degree of AHS use by visitors remains unclear. To assess AHS use, we observed visitor HHC and how it is affected by visual cues in a private university hospital.

Methods: Using an observational controlled study, we tested 3 interventions: a desk sign mandating all visitors to use AHS, a free-standing AHS dispenser directly in front of a security desk, and a combination of a freestanding AHS dispenser and a sign.

Results: HHC was 0.52% at baseline and did not improve significantly when the desk sign was provided as a cue (0.67% [P = .753]). However, HHC did improve significantly with use of the freestanding AHS dispenser (9.33%) and the sign and dispenser combination (11.67%) (P < .001 for all comparisons of dispenser alone and sign and dispenser with baseline and sign alone). The degree of improvement with the sign and dispenser combination over the dispenser was not statistically significant.

Conclusions: Hospital visitors represent an important factor in infection prevention. A coordinated effort is needed to increase visitor HHC, including an evaluation of the AHS placement, education of visitors on the importance of HHC, and evaluation of corresponding changes in hand hygiene behavior.

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opportunities and using the WHO’s standardized and validated tool, a recent study found no HHC rate exceeding 34% in groups of HCWs studied. In contrast to the attention that has been given to HCWs, HHC among hospital visitors has largely gone unmonitored, and thus it is impossible to state with confidence that it is improving. Although the evidence regarding visitors’ behavior in general is unclear, studies conducted in pediatric and neonatal ICUs have assessed the effectiveness of measures aimed at reminding visitors to maintain HH; however, even with elaborate educational efforts, HHC in these areas improved but did not exceed 60%. If rates in high-risk areas are <60%, then it is not surprising that HHC in hospital lobbies is far lower. To best encourage visitors to join the fight against infection, educational initiatives should be implemented, followed by studies to assess visitors’ HHC.

Like many health care facilities in the United States, our hospital requires all visitors to register at the security desk in the lobby. An AHS dispenser is mounted on a wall adjacent to the security desk along with a sign reminding visitors to “Clean hands here.” However, human factor engineers were not consulted about the ideal placement for the AHS. To determine whether visitors were actually using the AHS, we measured their baseline HHC rates and also assessed the effect of several external visual cues. We tested 2 categories of visual cues: a simple informative cue and a combined pair of cues. We hypothesized that immediate visibility of an AHS would improve HHC at the registration desk and/or the use of external cues would improve HHC among hospital visitors.

METHODS

This observational controlled study was conducted under an exemption by the University of Miami’s Institutional Review Board. Adult visitors entering the 560-bed tertiary care university hospital through the main entrance were observed for HHC as they registered with security. The observations were conducted twice daily (10-11:30 AM and 4-5:30 PM) on each day of the week to assess the baseline HHC rate and to determine whether the day of week or time of day had an effect on HHC rate. These times were chosen because they are the busiest for visitor entrances, based on a 2-time of day had an effect on HHC rate. These times were chosen because they are the busiest for visitor entrances, based on a 2-

To proceed to the hospital lobby and access the elevators, visitors must first register at the security desk, where the AHS dispenser was initially located (baseline location). A standard commercial dispenser containing AHS was mounted on a wall above the security desk before the study began. When facing the security guard who registers visitors, the dispenser was approximately 3 feet to the right of the center of the desk. A sign directly next to the dispenser read in English, “Clean hands here.” Because many of our visitors are Spanish-speaking, our intervention signs were in both English and Spanish. Visitors are not identified, and no record is kept of individual visitors.

We tested 3 interventions to assess the frequency of AHS use and the efficacy of the cues provided:

1. An 8.5 × 11-inch sign stating, “ATTENTION! All visitors MUST clean their hands!” in both English and Spanish (typed in red letters/40-point font on white paper) was placed on the security desk in clear view of all visitors.
2. A freestanding commercially available AHS dispenser was placed in front of the security desk. After each visitor registered, he or she had to pass directly in front of this dispenser to leave the registration area.
3. The sign was affixed to the top of the freestanding automatic dispenser. In addition, a sign was also placed on the desk.

To maintain the ecological validity of the study, the regular dispenser remained on the wall in its baseline location throughout the study. A visitor’s use of AHS at any time before leaving the security desk was considered positive HHC. The security officers and information desk attendants were aware of the study and were instructed to not volunteer any information about HHC to visitors unless asked a specific question.

Based on a pilot study, the sample size for each observation period was calculated at 150 persons to detect a 20% difference at a power of 0.8 and a 5% level of significance. To simplify the analysis, the baseline data were analyzed by logistic regression to determine whether we could pool the data over days of the week and time of day. We found no significant differences by day of week (P = .732), time of day (P = .762), or the interaction of day and time (P = .765), and thus we pooled the baseline data. The final analysis was a logistic regression of HHC on cues (baseline [no cue], sign only, dispenser only, and dispenser with sign).

Contrasts were used to make comparisons among cues. Percentages and 95% confidence intervals were computed from the logistic regression parameters. SAS version 9.2 (SAS Institute, Cary, NC) was used for all analyses; P < .05 was considered to indicate statistical significance.

RESULTS

The 3,000 observers visited for HHC included 2,100 observed during the baseline phase and 300 observed during each of the 3 intervention periods. HHC rates for each observation period and intervention are presented in Table 1.

The baseline HHC rate was 0.52% (Table 2). HHC rates when using the sign, the dispenser, and the sign and dispenser combination were 0.67%, 9.33%, and 11.67%, respectively (Table 2). Comparisons between baseline and the various cues show that the new dispenser location alone or in combination with the new sign produced a statistically significant increase in HHC (P < .001 for both cues). The sign cue alone was not significantly better than baseline (P = .753), and there was no significant difference between the dispenser and the sign and dispenser combination (P = .352).

DISCUSSION

This study has revealed 2 important findings: (1) If HHC is considered important among hospital visitors, then the rates are alarmingly low, and (2) the visual cues that we studied increased HHC only slightly. Despite the use of cues, HHC in visitors remained low, at ~10%. Although the improvements were statistically significant, these rates are clearly suboptimal.

We identified two factors that may explain the poor HHC in hospital visitors. First, to increase AHS use, hospitals should identify ideal dispenser locations based on human factor engineering and traffic flow studies. Second, our results suggest that even with the appropriate signage, visitors might not have fully understood that the AHS was intended for their use. A targeted approach with appropriate education may be indicated.

Visual cues and reminders, such as warning signs, can improve HHC among HCWs, and human factor research supports the use of external cues to trigger behavioral changes. Effective cues should target the action and its content. Reason proposed universal and secondary categories of attributes that qualify good cues. Universal reminders should apply to all cues, whereas the secondary attributes are applicable only in some cases. Effective cues should capture the subject’s attention at a critical time (conspicuous) and should be positioned in proximity to the location of the necessary actions (contiguous).
With regard to visual cues, the 2 most important factors are conspicuity (placing the cue in a visible place) and visibility (the ability to see the cue under all expected viewing conditions). Multimodal cues, such as warning signs (visual reminders and consequences), are more effective than unimodal cues, such as simple reminders. The efficacy of multimodal cues hinges on several dimensions, including the level of the hazard implied by the signal words, the extent of the implied risk, and the extent to which the cues match the referent. Our previous study found that 85% of adults washed their hands when using a public restroom. Perception of dirty hands is most recent study found that 85% of adults washed their hands when using a public restroom.19 Perception of potential personal consequences, that public restrooms are "dirty" and hospitals are “clean,” may explain the difference between our results and the Society’s findings. Visitors may perceive the relatively clean and safe feeling of the hospital environment as rendering HH insignificant, thus preempting the trigger for HHC.20 It also is conceivable that visitors may believe that the infection that they carry into the hospital is less dangerous than the infections that already exist in the hospital.

Our findings suggest that HHC among hospital visitors remains alarmingly low. The provision of visual cues improved compliance, but it still failed to reach a substantive level. To prevent community-acquired infections, which are a known risk for hospitalized patients, AHS dispensers should be strategically placed, clearly visible, and accessible to all visitors. More important, warning signs specifically directed at visitors should be attached to the dispensers explaining the serious consequences of transmitting infections to patients. Going a step further, mandating compliance would ensure that visitors clean their hands at least once before leaving the lobby and entering patient areas. Educational pamphlets and televised videos in hospital lobbies and patient rooms can reinforce the visitors’ role in decreasing infections and also alert them to the importance of HH in general. Further studies are warranted to examine ways to maximize HHC among both HCWs and visitors and to achieve a sustainable culture change in this critical behavior.

### Table 1

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Day</th>
<th>AM (n = 150)/day</th>
<th>PM (n = 150)/day</th>
<th>AM + PM (n = 300)/day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HHC×</td>
<td>HHC%</td>
<td>HHC×</td>
</tr>
<tr>
<td>Baseline</td>
<td>Monday</td>
<td>1</td>
<td>0.7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Tuesday</td>
<td>2</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Wednesday</td>
<td>2</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Thursday</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Friday</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sunday</td>
<td>1</td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>Pooled baseline*</td>
<td>Day x</td>
<td>6</td>
<td>0.6</td>
<td>5</td>
</tr>
<tr>
<td>Sign</td>
<td>Day y</td>
<td>12</td>
<td>8.0</td>
<td>16</td>
</tr>
<tr>
<td>Dispenser</td>
<td>Day z</td>
<td>19</td>
<td>12.7</td>
<td>16</td>
</tr>
</tbody>
</table>

* Denominators for pooled baseline: AM or PM = 1050; AM + PM = 2100. There were no significant differences in days of the week (P = .732), time of day (P = .762), or their interaction (P = .765).

### Table 2

<table>
<thead>
<tr>
<th>Cue</th>
<th>Percentage (95% CI)</th>
<th>Baseline</th>
<th>Sign</th>
<th>Dispenser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.52 (0.29-0.94)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sign</td>
<td>0.67 (0.17-2.63)</td>
<td>.755</td>
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<td></td>
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<tr>
<td>Dispenser</td>
<td>8.13 (5.52-13.19)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
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<tr>
<td>Sign and dispenser</td>
<td>11.67 (8.50-15.82)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.352</td>
</tr>
</tbody>
</table>

Cl, confidence interval.

### References