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Original Research Article

Effectiveness of a multimodal hand hygiene improvement strategy in the emergency department

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Background: Hand hygiene (HH) is essential in preventing nosocomial infection. The emergency department (ED) is an open portal of entry for pathogens into the hospital system, hence the important sentinel function of the ED personnel. The main objective of this study was to assess the effect of a multimodal improvement strategy on hand hygiene compliance in the ED.

Methods: Our study was a prospective before-and-after study to determine the effect of a multimodal improvement strategy on the compliance of HH in the ED according to the My 5 Moments of Hand Hygiene defined by the World Health Organization. Interventions such as education, reminders, and regular feedback on HH performance and role models were planned during the 3 intervention weeks.

Results: In total, 57 ED nurses and ED physicians were observed in this study, and approximately 1,000 opportunities for handrubs were evaluated during the 3 intervention periods. HH compliance increased significantly from baseline from 18% (74/407) to 41% (77/190) after the first intervention and stabilized to 50% (99/200) and 46% (96/210) after the second and third interventions, respectively.

Conclusions: Implementing a multimodal HH improvement program significantly improved the HH compliance of ED personnel.

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Nosocomial infections are a major risk to patient safety and contribute to prolonged length of hospital stay, costs, morbidity, and mortality among hospitalized patients.[1-3] Infection prevention improvement strategies are complex, and a multimodal strategy has proven to be the most successful.[4,5] Improving hand hygiene (HH) practices is the simplest and most cost-effective measure in preventing hospital-acquired infection.[6-8] Despite its importance, HH compliance rates are globally low.[9-11] Health care workers (HCWs) in the emergency department (ED) are no exception; however, limited data on infection control practices in this setting are available.[12-15]

EDs play a critical role in the patient admittance process because many patients are admitted to the hospital via the ED. Here, they can undergo invasive procedures; however, these procedures are relative rare in our ED setting.[12,16] Furthermore the ED personnel moves in and out of the patient room on multiple occasions during a patient's ED visit. The ED is typically characterized by a high patient volume, activity, and workload, the key risk factors for good HH compliance.[17,18] This high frequency of patient contact imposes a potential risk for transmission of infectious pathogens among the patients and HCWs. In the ED, HCWs may be influenced by a culture of substandard infection control practice because of the perceived urgency of patient conditions and the high number of patients.[12,15] The pathogens enter the hospital through admitted patients and the consulting specialists and residents who return to their wards after finishing consults at the ED. Hence, the ED is an open portal for the entry of pathogens into the hospital system.

The purpose of our study was to assess the effect of a multimodal improvement strategy on HH compliance in the ED. We performed a prospective multimodal intervention study (including education, reminders, regular feedback on hand disinfection performance, and introduction of role models) because all of these have been shown to be effective, especially when combined.[5,11,19,20] Furthermore, social norms in the ED were observed as part of this study.

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Conflicts of Interest: None to report.

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METHODS

Study design

We performed a prospective before-and-after study to improve HH in an ED in a Dutch tertiary care teaching hospital and level 1 trauma center. Evaluation of the intervention was based on process indicators. After approval was obtained from the head of the ED, the study commenced. The hospital's ethical committee exempted the study from full evaluation and approval because none of the interventions have negative effect on patient care.

Study setting and population

The study was conducted from May 2013-September 2013 at the ED with 21,000 annual visits in The Netherlands. The ED consists of 23 beds: 3 resuscitation rooms, 19 beds, and 1 triage room. A total of 39 nurses, 9 residents, and 5 staff physicians of the ED were observed during their working activities. One physician and 2 nurses were excluded because of their involvement in the study. Non-ED specialists and residents were not included in our observations. Care provided in the 3 resuscitation rooms was also excluded from the observations because of the nature and urgency, restricted access, and involvement of non-ED HCWs.

HH improvement strategies

Prior to this study, improvements were made to the infection control infrastructure. No changes were made to the number or location of the handwashing sinks. Handwashing sinks were available in all patient rooms.

The interventions were planned in 3 intervention weeks, 4weeks apart. Each intervention week consisted of a multimodal approach to promote HH awareness. No additional interventions were performed outside these 3 intervention weeks. During the intervention weeks, education on the 5 indications of HH according to the World Health Organization guideline and the relevance of preventing hospital-acquired infections were provided in daily presentations for the nurse staff and available physicians. Several reminders were used, such as distributing 75 pocket-sized flyers to the ED HCWs and 24 posters across the ED illustrating the importance of HH. Screensavers illustrating the 5 WHO indications of HH were installed on the 35 computers in the ED. Furthermore, an assessment of HH technique was available to HCWs by examining hands disinfected with a fluorescent rub-on under ultraviolet light during the education sessions. Daily feedback by new appointed nurses as role models was introduced during the second period and continued through the third intervention period. In the third intervention period, we used an undercover nurse, attempting to provoke colleagues to comment on his or her unprofessional behavior. The appointed nurses wore jewelry and ignored clothing regulations. By doing so we tested social norms in the ED, allowing HCWs to correct behavior of their colleagues.

Compliance rates were presented after each intervention week (baseline and intervention weeks 1-3) to all HCWs. Overall compliance rates and compliance rates for the 5 individual moments were also presented. Furthermore, compliance rates were given for nurses and physicians separately.

Measurements

All observations were conducted by 2 medical students during their internship at the ED. Physicians and nurses of the ED were not aware of the role of these students. Both medical students were educated by a consultant microbiologist (head of the infection prevention unit) and extensively trained by an infection control nurse on the 5 HH indications with subsequent HH actions. The observers recorded potential opportunities for HH by HCWs and the performed HH action. HH compliance was measured according to the WHO observation forms containing the 5 indications for HH.[1] These indications are as follows: (1) before patient contact, (2) before clean-aseptic procedure, (3) after body fluid exposure risk, (4) after touching a patient, and (5) after touching patient surroundings. The medical students had observations sheets with them at all times.

Baseline data were collected in the 3 weeks before the first intervention week. After baseline measurements, observations were performed 1 week directly after every intervention week. Observations took place during the day and in the evening, on both week and weekend days. No measurements for weekends were made after the baseline measurements because no differences were identified during these measurements. Additionally, for every handrub (HR) indication, the number of patients was compared with the total amount of nurses working in the ED at that moment, resulting in the patient-nurse ratio. The results were divided into 3 categories: I (0-1.0), II (1.0-1.50), and III (1.50-3.5).

Data analysis

All data were analyzed using SPSS version 20.0 (SPSS, Chicago, IL). The main outcome parameter was HH compliance; HH compliance (%) was calculated as the number of HRs divided by the total number of HR indications.

Descriptive statistics included percentages, means, and SDs. Fixed factors included strategy period, profession, and time of day (week vs weekend and day vs evening). Furthermore, we investigated whether HH compliance related to factors such as type of patients and the total number of patients compared with the number of available ED personnel. The χ^2 test was applied when analyzing the data. Results with $P < .05$ were considered statistically significant.

RESULTS

In our study, a total of 1,007 opportunities for HR were recorded in the ED. During the baseline period, 407 HH opportunities (nurses: n = 250; physicians: n = 157) were recorded with overall HH compliance of 18.2% (95% confidence interval [CI], 14%-22%). HH compliance increased significantly ($P < .001$) after the first intervention week to 40.5% (95% CI, 33%-48%) and stabilized ($P = .075$) after the second intervention week at 49.5% (95% CI, 43%-56%). Finally, HH compliance after the last intervention week (45.7%; 95% CI, 39%-53%) did not differ significantly from the compliance after the second intervention week ($P = .443$). The results of the observations from all 4 time points are shown in Figure 1.

The total number of alcohol dispensers was increased from 25 to 55. Within every 5-m radius in the ED an alcohol dispenser was placed. Existing alcohol-based HR was switched for a different brand for its proven skin friendliness. Furthermore special attention was paid to strategic locations, such as task-specific trolleys (intravenous drip, indwelling catheter, lumbar puncture, and suture) and the radiology corner. The latter is where the multidisciplinary trauma team gathers and discusses the management of the multitrauma patients.

Profession-specific analysis revealed a significant increase over the phases of the study in both subgroups: the physicians and nurses. The nurses started with a compliance of 12.4% (95% CI, 8%-14%) and ended at 47.0% (95% CI, 30%-48%; $P < .001$); the subgroup of physicians started at 27.4% (95% CI, 20%-34%) and reached 43.6% (95% CI, 26%-45%; $P = .013$) compliance. (Table 1 and Fig 1)

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