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## Major Article

## A multimodal intervention to improve hand hygiene compliance in a tertiary care center

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## Key Words:

Hand hygiene

Audit

Hand hygiene adherence rate (HHAR)

Knowledge, attitude, and practice

**Background:** Healthcare-associated infections (HAIs) are a major threat to patient safety worldwide. HAIs are mainly transmitted via the hands of healthcare workers (HCWs), and HCW compliance with hand hygiene (HH) practices is reportedly low. Therefore, multimodal interventions are needed to develop effective HH improvement strategies. In this study, we assessed the effect of multimodal interventions on improvement of HH compliance.

**Methods:** This study was conducted in 2 intensive care units from August 2016 to October 2016. It encompassed 3 phases: pre-intervention (20 days), intervention (1 month), and post-intervention (20 days). A total of 53 HCWs, including physicians, nurses, and housekeeping staff, were included in the HH audit. The audit was analyzed by direct observation and by a completed knowledge, attitude, and practice (KAP) questionnaire.

**Results:** A total of 6350 HH opportunities were recorded; the results were 34.7%, 35%, and 69.7% for hand hygiene complete adherence rate (HHCAR), hand hygiene partial adherence rate (HHPAR), and hand hygiene adherence rate (HHAR), respectively. The HHCAR in the pre-intervention and post-intervention phases were 3% and 70.1%, respectively. HHCAR was highest among nurses (3.6% in the pre-intervention phase and 80.7% in the post-intervention phase). Other findings were that senior physicians had better HH compliance than junior physicians; in the pre-intervention phase, the HHCAR was better in the evening (4.8%); in the post-intervention phase, the HHCAR was better in the morning (72.1%); women had a higher HHCAR than men; and in the pre-intervention phase, good compliance was seen with Moments 2 and 3 of the World Health Organization's (WHO) Five Moments for Hand Hygiene, whereas in the post-intervention phase, good compliance was seen with Moments 3, 4, and 5. Questionnaire-based data were also analyzed to assess KAP of HH. We found that only 55%-82% of HCWs were aware of the WHO's Five Moments for Hand Hygiene. In the post-intervention phase, we observed a significant improvement in KAP of the study group.

**Conclusion:** Significant improvement in HH compliance can be achieved through a systematic, multidimensional intervention involving all types of HCWs.

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## BACKGROUND

Hand hygiene (HH) is recognized as the most effective means of reducing healthcare-associated infections (HAIs). Various studies worldwide have shown that improving compliance with HH principles is achieved by target-specific active interventions. The World Health Organization (WHO) has enumerated various methods of measuring HH practices, such as direct observation, the measurement of product use, the conduct of surveys, patient-centered

surveillance, and the use of electronic modalities, of which direct observation is considered the gold standard practice. Conducting surveys on knowledge, attitude, and practice (KAP) will help identify gaps and plan for target-based interventions.<sup>1</sup>

Most patients in intensive care units (ICUs) are immunocompromised and require long-term supportive care. They are on devices such as ventilators, urinary catheters, and central lines, which make them more susceptible to HAIs, thus making ICUs the epicenters of infection. Therefore, strict HH practices will help reduce patient morbidity and mortality.<sup>2</sup> Continuous education and training is the most commonly followed approach to increase awareness and improve HH compliance. Multimodal interventions, such as training, questionnaires, audits of HH compliance among health-care workers (HCWs), and reward and punishment systems, are required to increase HH compliance and reduce HAIs.

This study measured differences in HH compliance prior to and after a variety of multimodal interventions, including classes and case scenario discussions, visual reminders, and practical demonstrations.

## METHODOLOGY

This was a prospective interventional study, conducted in 2 ICUs of a tertiary care hospital with a total occupancy of 12 beds each. The duration was from August 2016 to October 2016 (3 months). The study encompassed 3 phases: pre-intervention (20 days), intervention (1 month), and post-intervention (20 days). A total of 53 HCWs, including physicians (ie, faculty, residents, and interns), nurses, and housekeeping staff, participated in the audit.

The audit form used in our study was designed based on a WHO HH audit toolkit.<sup>3</sup> The observer was given baseline training on the WHO Five Moments for Hand Hygiene. He was taught to audit HH, and then he evaluated using the case scenarios and videos. During the observation period, the observer recorded 3 elements: HH opportunities available to the HCWs, complete HH actions performed by the HCWs, and partial HH actions performed by the HCWs. Following all the steps of hand rub or hand wash as recommended by the WHO was considered as completely followed; following fewer than all the steps was considered as partially followed. Hand hygiene complete adherence rate (HHCAR), hand hygiene partial adherence rate (HHPAR), and hand hygiene adherence rate (HHAR) were calculated using standard formulas.<sup>1</sup>

$$\text{HHCAR} = \frac{\text{No. of times hand hygiene followed completely}}{\text{No. of opportunities of hand hygiene moments available}} \times 100$$

$$\text{HHPAR} = \frac{\text{No. of times hand hygiene followed partially}}{\text{No. of opportunities of hand hygiene moments available}} \times 100$$

$$\text{HHAR} = \frac{\text{No. of times hand hygiene followed (complete + partial)}}{\text{No. of opportunities of hand hygiene moments available}} \times 100$$

Attempts were made to calculate the following: profession-specific HHCAR (physicians, nurses, and housekeeping staff); the influence of professional experience on HH compliance among physicians and nurses (ie, senior vs. junior); sex variation (men vs. women); and HH practice during all 3 shifts (morning, evening, and night). The Moment-specific HHAR (complete and partial together) for each of the 5 WHO HH Moments was also calculated.

To ensure reliability of the audit and to minimize bias associated with direct observation, the following measures were taken: i) the auditor received prior training; ii) the audit was carried out in a random schedule of the day, thus obviating the confounding bias of work pressure influencing HH compliance; and iii) the observer was involved in all 3 phases of the audit, thus eliminating interobserver variation.

### Pre-intervention phase

Baseline HHCAR, HHPAR, and total HHAR were analyzed by the observer. Questionnaires given to HCWs assessed baseline KAP of HH, based on which multimodal interventions were planned in the intervention phase.

### Intervention phase

Based on the results of the pre-intervention phase, multimodal strategies were developed. Potential shortcomings were analyzed and discussed with internal infection control experts, and mediation measures were devised. Education and extensive training on HH practices were given to all participants by multiple approaches. Classes were given to all HCWs, emphasizing the adverse effects on patients if HH principles are not followed. The WHO Five Moments for Hand Hygiene were explained and demonstrated to all HCWs. Charts of WHO-recommended Moments and steps of HH were displayed in all ICUs, wards, and near all wash sinks. Whenever an HCW forgot to practice HH, he or she was reminded to follow HH protocols. Additional HH practices were thoroughly monitored and strengthened by one-on-one interactions. Also, since housekeeping staff members play an important patient care role, interventional sessions were tailored, taking into account their educational background and language restrictions, to ease the learning process.

### Post-intervention

The effect of interventional strategies was analyzed by measuring the HHCAR, HHPAR, and HHAR. Questionnaires were also given to the participants to measure changes in KAP.

## STATISTICAL ANALYSIS

HHCAR and HHPAR were expressed in frequency and percentage. Comparison of HHCAR and HHPAR between the pre-intervention and post-intervention phases was carried out using the chi-square or Fisher exact test. Shift-specific, sex-specific, profession-specific, and Moment-specific compliance were compared using the  $\chi^2$  test or Fisher exact test, using Epi Info software (version 6). For the questionnaire-based study, the same statistical tests were used for comparison. All statistical analyses were carried out at a 5% level of significance, and *P* values less than .05 were considered statistically significant.

## RESULTS

A total of 53 HCWs were audited during the study period. A total of 6350 HH opportunities were recorded during the study period. The HHCAR, HHPAR, and HHAR were 34.7%, 35%, 69.7%, respectively, as depicted in Table 1. HHCAR in the pre-intervention and post-intervention phases were 3% and 70.1%, respectively, reflecting a dramatic improvement in HH compliance. Notably, a decrease in HHPAR was observed from 47.2% in the pre-intervention phase to 21.4% in the post-intervention phase. These findings further show the significant effect of interventional modalities on study participants (*P*<.001).

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