

## Original Research Article

# Hand hygiene compliance among healthcare workers in a tertiary care academic health care organization

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## ABSTRACT

**Background:** Healthcare Associated Infections (HAIs) are a major cause of high morbidity, disability, mortality and rising costs for health systems. Preventing the HAI risk by planning and implementing effective preventive strategies is important to safeguard patient health. Handwashing is one of the fundamental measures for preventing transmission of hospital-acquired infections.

**Methods:** This cross-sectional observational study was conducted in the surgical ICU from January to February 2018 to evaluate the presence of adherence to the different aspects of HH. Inclusion criteria included all nurses and allied healthcare workers of surgical ICU while all other HCWs were excluded. Two observers collected all HH data. During this analysis, 3000 HH opportunities were observed. HH compliance was tested for all 5 moments as per WHO guidelines. Data thus collected were entered into a computer-based spreadsheet for analysis using SPSS statistical software (version 20) (IBM Corp., NY, USA).

**Results:** Overall hand hygiene compliance observed as per WHO Guidelines was 79.8%. Nurses had an adherence rate of 77.8%; allied staff adherence was 81.8%. Nurses' compliance after touching patient surroundings was lowest at 60.7%. 96% staff was aware of the facts like diseases prevented by hand washing, ideal duration of HH, reduction of health care associated infections.

**Conclusions:** Overall, the involved ICUs showed low levels of adherence to best hygiene practices with overall compliance of 79.2%. This suggests the need to implement immediate strategies for infection control in the ICUs. A multidisciplinary intervention could be effective in preventing and control the HAI risk.

**Keywords:** Compliance, Hand hygiene, Hand hygiene compliance, 5 Moments

## INTRODUCTION

Healthcare Associated Infections (HAIs) are caused by environmental pathogens or patient's endogenous flora.<sup>1</sup> Regular monitoring the five moments of hand hygiene by direct observation is a standard practice recommended by the World Health Organization (WHO) and constitutes a major preventive strategy of healthcare-associated infections.<sup>2</sup> Multiple studies suggests compliance with hand hygiene remains low among healthcare workers,

ranging from 5% to 89%.<sup>3,4</sup> The WHO's recommended hand hygiene includes six unique steps with the primary objective of ensuring adequate coverage of all hand skin surfaces by cleaning products.

Hand Hygiene (HH) is among the most efficient methods of infection control programs, but compliance is generally poor. Hand hygiene improvement interventions must include control of compliance, which is mostly conducted by direct observation. Adherence to hand

hygiene recommendations is the most important means to prevent and control the spread of Healthcare Associated Infections (HAI).

Health care associated infections affect 1 in 20 hospitalized patients.<sup>5</sup> Patients in the ICUs are more likely to be colonized or infected by multi-drug resistant organisms. Most of these infections are spread via health care workers' hands. HH is the single most effective measure to prevent this spread.

Although emerging technology continues to expand the available choices, widely recognized hand hygiene compliance systems currently include direct observation, electronic or automated systems, and systems based upon advanced technologies.<sup>6</sup> Direct observation is currently considered the gold standard in hand hygiene compliance technology.

Direct observation involves in-person evaluation of hand hygiene habits of HCW within the healthcare environment by highly trained personnel.<sup>6,7</sup> Direct observation allows for real-time feedback and evaluation of all five of WHO's five moments for hand hygiene, and allows observation of which hand hygiene products are used, the thoroughness of cleansing, the tools and technique used for drying, and the use of gloves.<sup>8</sup> Thus the present study was done to evaluate the presence of adherence to the different aspects of HH among nurses and allied healthcare workers.

## METHODS

The hospital is a tertiary level multispecialty teaching hospital. Surgical and trauma ICU have conveniently located hand washing facilities and availability of alcohol-based hand rub gels with each bed. The study

was carried out from January to February 2018 in 10 bedded ICU.

A survey was done, prior to the study, by filling a pretested close ended validated questionnaire modified from WHO Hand Hygiene Knowledge Questionnaire for Health-Care Workers. The questionnaire was pertaining to intentions of adherence to HH, perception and knowledge, opportunities, steps, actions and attitude toward HH (Annexure 1).

The nursing staff (n = 31) and allied healthcare workers (n = 12) was taken as a sample size. All the staff had undergone an orientation and training program in HH practices as per WHO guidelines.

In present study, only two observers were involved in conducting all the observations. Before the start of the study period, both the researchers had discussed all aspects of observations in detail regarding what constituted each hand hygiene opportunity and what a lapse was and only the opportunities as listed on the observation sheet were recorded. Study also conducted 10 trial runs of observation periods where we cross-checked each other's observations and clarified doubts. This reduced inter-observer variation and guaranteed uniformity of data collection. Observers stayed in the ICU for 12 hours every day.

Data were collected over 12 hours shifts, between 8 am and 8 pm for 6 shifts and 8 pm to the next morning 8 am for 4 shifts. The healthcare staff was not aware of this data collection since the observer was part of the team of junior doctors working in the ICU. Direct observation involved observing 150 opportunities per day. Observer visited the ICU over a period of 12 h each time, till 3000 observations were completed.

**Table 1: Hand washing adherence\* was assessed using direct observation and survey. who's 5 moments of hand hygiene opportunities was surveyed.**

| WHO 5 moments | Observation (a)  | Opportunity (b)   |
|---------------|--|---|
| 1             | Number of observed hand hygiene actions before touching a patient          | Number of observed hand hygiene opportunities before touching a patient           |
| 2             | Number of observed hand hygiene action before clean/aseptic procedures     | Number of observed hand hygiene opportunities before clean/aseptic procedures     |
| 3             | Number of observed hand hygiene action after body fluid exposure/risk      | Number of observed hand hygiene opportunities after body fluid exposure/risk      |
| 4             | Number of observed hand hygiene action after touching a patient            | Number of observed hand hygiene opportunities after touching a patient            |
| 5             | Number of observed hand hygiene action after touching patient surroundings | Number of observed hand hygiene opportunities after touching patient surroundings |

\*Adherence = A/B

The observations were noted for all five moments of HH before and after patient contact. A separate checklist was used for nursing and allied staff. If an indication for HH

was noted, a tick was placed on the checklist next to the relevant guideline, under the column "indication". If HH occurred, another tick was inserted in the column

“occurred.” If it did not occur, no insertion was made. The process was followed during the stud period and averages were taken to calculate the adherence rate, as in Table 1.

Data thus collected were entered into a computer-based spreadsheet for analysis using SPSS statistical software (version 20) (IBM Corp., NY, USA).

## RESULTS

During the study period 3000 HH opportunities were observed in the surgical ICU. Among 43 healthcare workers, 31 were nurses (72.1%), and 12 (27.9%) other healthcare workers (technicians, physiotherapists).

Among the HCWs, out of the total opportunities, nurses had the highest number of contacts (74.5%), followed by allied healthcare workers (25.5%). The average compliance was 79.8%, which differed significantly among healthcare workers, with higher compliance among the allied staff (81.8%) followed by nurses (77.8%) (Table 2). Maximum compliance was seen for moment 3 among all categories followed by moment 4 among nurses and moment 1 among allied staff.

The HH instances after patient contact (82.5%) also suggested similarly. The nurses' compliance was 77.8% before patient contact and 60.7% after touching surroundings. The allied staff had an almost equal distribution across all moments except moment 5 with a compliance of around 69.3% (Table 3).

**Table 2: Overview of hand hygiene opportunities.**

| Healthcare worker | Number | Opportunities of hand hygiene n (%) | Compliance n (%) |
|-------------------|--------|-------------------------------------|------------------|
| Nurses            | 31     | 2235 (74.5)                         | 1741 (77.8)      |
| Others            | 12     | 765 (25.5)                          | 626 (81.8)       |

**Table 3: Observed compliance for nurses and allied staff.**

| WHO 5 moments of hand hygiene | Nurses (31)     |                 |               | Others (12)     |                 |               |
|-------------------------------|-----------------|-----------------|---------------|-----------------|-----------------|---------------|
|                               | Observation (A) | Opportunity (B) | Compliance* % | Observation (A) | Opportunity (B) | Compliance* % |
| 1                             | 623             | 801             | 77.8          | 171             | 201             | 85.1          |
| 2                             | 164             | 267             | 61.4          | 117             | 141             | 82.9          |
| 3                             | 487             | 538             | 90.5          | 174             | 201             | 86.6          |
| 4                             | 278             | 318             | 87.4          | 94              | 121             | 77.7          |
| 5                             | 189             | 311             | 60.7          | 70              | 101             | 69.3          |

\*% compliance = A/B X 100%

The HH compliance for moment 5 that is, after touching patient surroundings, was poor across all staff. There was slight difference in compliance rates between day and night times. However, compliance fell when the ICU was busy especially during acute resuscitation settings or if multiple admissions occurred simultaneously.

Analysis of the survey showed that 96% of the healthcare staff was aware of HH facts viz. Diseases prevented by HH, type of dirt tackled by hand washing, ideal duration of HH and the extent of reduction of HAI. Reasons for non-adherence emerged as unavailability of hand rub at the clinical area, workload pressure and nurse shortages.

## DISCUSSION

The nurses had an overall compliance of 77.8% that is comparable to most other studies.<sup>9-11</sup> They fared best for WHO moment 3 and 4 that is, after body fluid exposure risk and patient contact with compliance of 90.5% and 87.4% respectively. This may be due to the fact that staff

were very careful after body fluid contact as it was perceived important for self-protection. They fared the worst for WHO moment 5 that is, after touching patient surroundings (60.7%). In a study by Sanchez-Carrillo et al noncompliance according to WHO's 5 Moments for HH was greater for moment 5 (30.1%).<sup>12</sup> It was found that most nurses clubbed moment 1 and 2 together and would not additionally perform HH before suctioning or doing any other clean procedure.

In a study by Marra et al comparing the observational method, product use method and electronic surveillance, the overall rate of HH adherence was found to be 62.3% (there were 2,249 opportunities for HH observed, and representing 1,402 cleansing episodes).<sup>13</sup> However, they did not collect data for individual moments. In a study by Sanchez-Carrillo et al lower compliance during the baseline evaluation was observed by video monitoring compared with direct observation ( $P < 0.05$ ).<sup>12</sup> The allied staff fared better overall with a compliance of 81.8%. All opportunities for allied staff were observed during daytime, and most of the patient contact was elective and

planned. This could be one reason why they did better at HH adherence. In a study by Randle et al, a 24 hours observational study, it was found that out of the total of 823 HH opportunities compliance was 47% for doctors, 75% for nurses, 78% for allied health professionals, and 59% for ancillary and other staff ( $p < 0.001$ ).<sup>14</sup>

There is no standard for measuring adherence to HH. Directly observing adherence to HH is the method used in most studies.<sup>9,10,12</sup> WHO guidelines recommend the use of direct observation for monitoring HH compliance. It provides qualitative and quantitative information about why and when failures occur. There are recent studies that doubt the efficiency of direct observation methods. In our study, we found that moment 5 fared the worst in terms of HH adherence. Soon after the study was over, corrective training was done to address this.

Direct observations have limitations; they are time-consuming, manpower intensive, do not allow continuous monitoring. They probably provide information about a very low percentage of all HH opportunities. If staff is aware, direct observation may affect health care workers behaviour (Hawthorne effect).<sup>15</sup> Study limit these difficulties by engaging a single trained observer. However, there could be opportunities that were missed. It was also made sure that none of the staff involved in the study was aware of the observer as data was collected during his duty rotation. None of the staff was given performance feedback during the study period. The questionnaire was filled before the study period started as part of regular feedback on training.

More importantly, its validity is greatly limited by the Hawthorne effect, or altered behaviour of HCWs in response to being observed; one study found that Healthcare workers performed eight hand hygiene events per hour when not under observation compared with 21 hand hygiene events per hour during observation while a similar study found that hand hygiene event rates were approximately threefold higher in hallways within eyesight of an auditor compared with when no auditor was visible and the increase occurred after the auditors' arrival; the authors of the second study added that the results called into question the accuracy of publicly reported hospital hand hygiene compliance rates.<sup>16,17</sup>

A periodically check of HCW knowledge would be advisable in order to fill any gaps, improve training, reduce HAI and increase prevention measures compliance. In developing world like India, direct observation remains a widely used, easily reproducible method for monitoring compliance where technology to monitor adherence may not be available. Continuous training, performance feedback and verbal reminders will be needed to sustain adherence to HH which is evidence-based, field-tested and has a user-centred approach in a wide range of settings.

## CONCLUSION

Overall, the involved ICUs showed low levels of adherence to best hygiene practices with overall compliance of 79.2%. This suggests the need to implement immediate strategies for infection control in the ICUs. A multidisciplinary intervention could be effective in preventing and control the HAI risk.

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**Annexure 1: hand hygiene knowledge questionnaire**

Name \_\_\_\_\_

Staff ID \_\_\_\_\_

Date \_\_\_\_\_

(tick one answer only)

1. What are we trying to reduce or eliminate when we are doing handwashing?
  - a. Viruses
  - b. Bacteria
  - c. Fungi
  - d. All of the above
  
2. The most common cause of infections in the hospital is:
  - a. Blood pressure cuffs
  - b. Computer keyboards
  - c. Theatre trolleys
  - d. Poor hand hygiene
  
3. To what degree do you think there is a relationship between good hand hygiene practices and preventing hospital acquired infections?
  - a. Very weak
  - b. Weak
  - c. Neither weak nor strong
  - d. Strong
  
4. You should wash your hands before & after you wear your gloves
  - a. True
  - b. False
  
5. The advantage of using alcohol hand rubs:
  - a. It is self drying
  - b. It is more accessible than sinks
  - c. It is faster to use than traditional methods
  - d. All the above
  
6. Which of the following is a recommendation of the World Health Organization (WHO)? Perform hand hygiene:
  - a. Before and after having direct contact with patients
  - b. With alcohol-based hand rub if hands are not visibly soiled
  - c. After removing gloves
  - d. Before handling an invasive device (regardless of whether or not gloves are used)
  - e. All are WHO recommendation
  
7. There is no need to perform hand hygiene after using a tissue for coughing or sneezing.
  - a. True
  - b. False
  
8. The shortest time required to disinfect hands effectively with alcohol hand rubs is:
  - a. 5 seconds
  - b. 10 seconds
  - c. 15 seconds
  - d. 60 seconds
  
9. What is the most frequent source of germs responsible for health care-associated infections?
  - a. The hospital's water system
  - b. The hospital air
  - c. Germs already present on or within the patient

- d. The hospital environment (surfaces)
10. Which of the following hand hygiene actions prevents transmission of germs to the patient?
- Before touching a patient
  - Immediately after a risk of body fluid exposure
  - After exposure to the immediate surroundings of a patient
  - Immediately before a clean/aseptic procedure
11. Which of the following hand hygiene actions prevents transmission of germs to the health-care worker?
- After touching a patient
  - Immediately after a risk of body fluid exposure
  - Immediately before a clean/aseptic procedure
  - After exposure to the immediate surroundings of a patient
12. Artificial nails, gel nails or extenders are not permitted for staff who have patient contact.
- True
  - False
13. Which of the following statements on alcohol-based handrub and handwashing with soap and water are true?
- Handrubbing is more rapid for hand cleansing than handwashing
  - Handrubbing causes skin dryness more than handwashing
  - Handrubbing is more effective against germs than handwashing
  - Handwashing and handrubbing are recommended to be performed in
14. In general, what is the impact of a health care-associated infection on a patient's clinical outcome?
- Very low
  - Low
  - High
  - Very high
15. What is the effectiveness of hand hygiene in preventing health care-associated infection?
- Very low
  - Low
  - High
  - Very high
16. Among all patient safety issues, how important is hand hygiene at your institution?
- Low priority
  - Moderate priority
  - High priority
  - Very high priority
17. What is the minimal time needed for handwashing with soap and water to kill most germs on your hands?
- 20 seconds
  - 40 seconds
  - 1 minute
  - 10 seconds
18. Which type of hand hygiene method is required in the following situations?
- Before palpation of the abdomen  Rubbing  Washing  None
  - Before giving an injection  Rubbing  Washing  None
  - After emptying a bedpan  Rubbing  Washing  None
  - After removing examination gloves  Rubbing  Washing  None

- e. After making a patient's bed  Rubbing  Washing  None
- f. After visible exposure to blood  Rubbing  Washing  None

19. In your opinion, how effective would the following actions be to improve hand hygiene permanently in your institution?

Please tick one  ” on the scale according to your opinion.

a. Leaders and senior managers at your institution support and openly promote hand hygiene.

Not effective  ---  ---  ---  ---  ---  ---  Very effective

b. The health-care facility makes alcohol-based handrub always available at each point of care.

Not effective  ---  ---  ---  ---  ---  ---  Very effective

c. Hand hygiene posters are displayed at point of care as reminders.

Not effective  ---  ---  ---  ---  ---  ---  Very effective

d. Each health-care worker receives education on hand hygiene.

Not effective  ---  ---  ---  ---  ---  ---  Very effective

20. Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs?

- a. Wearing jewellery  Yes  No
- b. Damaged skin  Yes  No
- c. Artificial fingernails  Yes  No
- d. Regular use of a hand cream  Yes  No