



# Hand hygiene: An educational intervention targeting grass root level

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## ARTICLE INFO

### Article history:

Received 2 August 2018

Received in revised form

18 December 2018

Accepted 25 December 2018

### Keywords:

Hand hygiene

Medical students

Targeted educational intervention

## ABSTRACT

**Background:** Hands are the most common vehicle for the transmission of pathogens within the healthcare environment. Hand hygiene is the leading measure for reducing healthcare-associated infections (HCAIs) and preventing the spread of antimicrobial resistance.

**Objective:** An interventional study was carried out to evaluate the knowledge, attitude and practices of hand hygiene among third semester medical students.

**Materials and methods:** A total of 152 medical students were evaluated using a pretest self-structured questionnaire to assess the knowledge, attitude and practices regarding hand hygiene. The students were trained by faculty of microbiology vigorously with the help of a lecture and demonstration on hand hygiene followed by hands-on training. The same group of students were then distributed the post-training questionnaire. The pre-training and post training data was analyzed and compared.

**Result:** There was a significant improvement in knowledge, attitude and practice towards hand hygiene among students after intervention, as seen on comparison of results of post-test questionnaire from its pre-test counter-part because the doubts in the mind of the students got cleared in the education sessions.

**Conclusion:** Targeting medical students and teaching them the good standard practices was fruitful as they were young, easy to mold and enthusiastic and above all they are the future doctors. Such educational intervention regarding hand hygiene will be carried out for each batch of medical students in future.

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## Introduction

Hand hygiene is recognized as the leading measure to prevent cross-transmission of microorganisms and to reduce the incidence of health care associated infections (HCAIs) [1–3].

With the emergence of multi-drug resistant (MDR) pathogen, health care practitioners (HCPs) are reversing back to the basics of infection prevention by simple measures like hand hygiene. This is because enough scientific evidence supports the observation that if properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities (HCFs) [4–9]. Transient flora (transient microbiota), which colonizes the superficial layers of the skin, is more amenable to removal by routine hand hygiene. Transient microorganisms do not usually multiply on the skin, but they survive and sporadically multiply on skin surface. They are often acquired by health care workers (HCWs) during direct contact with patients or contaminated envi-

ronmental surfaces adjacent to the patient and are the organisms most frequently associated with HCAIs [10–12].

Third semester medical students pursuing undergraduate degree constitute a large population of HCP. These students keep shunting from one clinic to another and also between the medical college and hospital and are potential source of dispersal of transient flora not only between the units in the hospital but also in the community. The medical student's compliance with hand hygiene guidelines seems to be more vital in preventing the disease transmission among patients. It is therefore necessary to assess the medical student's knowledge, attitude and practices of hand hygiene so that appropriate strategies can be developed to promote hand hygiene compliance.

This was an interventional study carried out with the objective to evaluate the knowledge, attitude and practices of hand hygiene among third semester medical students.

## Material and methods

An interventional study was carried out among the third semester medical students studying in Subharti Medical College

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**Table 1**  
Comparison of pre and post training correct responses regarding knowledge of hand hygiene in medical students.

S. no.	Questions	Responses of students		p-Value
		Pre-training No. (%) (n = 152)	Post-training No. (%) (n = 152)	
1	How many steps are involved in hand hygiene as per WHO? (6)	34 (22.36%)	150 (98.68%)	0.000
2	What are the constituents of hand rub? (70% alcohol + 0.5% chlorohexidine)	100 (65.78%)	149 (98.03%)	0.000
3	What is the duration of surgical scrub? (3–5 min)	88 (57.89%)	142 (93.42%)	0.000
4	Which flora is removed by hand washing? (Transient flora)	132 (86.84%)	148 (97.37%)	0.001
5	What is the duration of hand washing as per WHO? (1 min)	124 (81.58%)	152 (100%)	0.000
6	What is the duration of hand rub as per WHO? (30 s)	124 (81.58%)	152 (100%)	0.000
7	If hands are soiled you should do? (Hand washing)	128 (84.21%)	150 (98.68%)	0.000
8	Which of the following pathogens can be transmitted through hands? (All – MRSA, VRE & ESBL producers)	114 (75%)	135 (88.81%)	0.002
9	Hand hygiene reduces: (Cross infection)	100 (65.79%)	145 (95.39%)	0.000
10	Ultimate goal of hand hygiene is to reduce: (Health care associated infection)	126 (82.89%)	152 (100%)	0.000
11	Jewellery is a potential source of colonization and transmission of potential pathogens? (Yes)	126 (82.89%)	150 (98.68%)	0.000
12	Hand rubbing is more effective against micro-organisms than hand washing. (Yes)	102 (67.11%)	142 (93.42%)	0.000

**Table 2**  
Comparison of pre and post training correct responses regarding attitude towards hand hygiene in medical students.

S. no.	Questions	Responses of students		p-Value
		Pre-training No. (%) (n = 152)	Post-training No. (%) (n = 152)	
1	Do you carry hand rub in your pocket? (Yes)	138 (90.79%)	151 (99.34%)	0.0005
2	Infection control team has a positive influence on your hand hygiene? (Yes)	144 (94.74%)	152 (100%)	0.0041
3	Do you think hand hygiene is an essential part of your role? (Yes)	146 (96.05%)	152 (100%)	0.0133
4	Infection control banners remind you of hand hygiene? (Yes)	146 (96.05%)	152 (100%)	0.0133
5	Do you forget to maintain hand hygiene? (No)	112 (73.68%)	132 (86.84%)	0.0039

**Table 3**  
Comparison of pre and post training correct responses regarding practice of hand hygiene in medical students.

S. no.	Questions	Responses of students		p-Value
		Pre-training no. (%) (n = 152)	Post-training no. (%) (n = 152)	
1	Following are WHO recommended 5 moments of hand hygiene. You follow hand hygiene for which moment?			
	a) Before touching a patient (Yes)	144 (94.74%)	152 (100%)	0.0041
	b) Before aseptic procedure (Yes)	144 (94.74%)	152 (100%)	0.0041
	c) After body fluids exposure (Yes)	140 (92.11%)	152 (100%)	0.0004
	d) After touching a patient (Yes)	150 (98.68%)	152 (100%)	0.1559
	e) After touching patient's surroundings (Yes)	140 (92.11%)	152 (100%)	0.0004
2	Do you adhere to correct steps of hand hygiene everytime? (Yes)	122 (80.26%)	142 (93.42%)	0.0006
3	Do you guide others to follow hand hygiene? (Yes)	140 (92.11%)	150 (98.68%)	0.0062
4	Do emergencies and other responsibilities make hand hygiene more difficult? (Yes)	98 (64.47%)	130 (85.53%)	0.000
5	Do you feel guilty if you omit hand hygiene? (Yes)	132 (86.84%)	148 (97.37%)	0.0006

and attending clinical postings in associated Chattrapati Shivaji Subharti Hospital, a tertiary care hospital in Meerut, Uttar Pradesh, India. The study was carried out for a period of 3 months from April to June 2017.

A total of 152 students of both the genders participated in this study. The students were explained about the objective of the study and verbal consent was obtained from them. The participation of students was voluntary. A self-structured questionnaire containing a set of questions assessing knowledge, attitude and practices of hand hygiene was distributed to all the students. There were total of 22 questions; 12 assessing the knowledge, 5 the attitude and 5 practice. (Tables 1–3) The time allotted for the questionnaire was 22 min, approximately 1 min/question.

After the pre training evaluation, vigorous training of the students was carried out by head of the Department and faculty of Microbiology as follows (i) Lectures (power point presentations) and practical demonstrations on hand hygiene followed by hands-on training on WHO “My five moments of Hand Hygiene”, steps and role of hand hygiene in preventing HCAs were conducted.

(ii) A workshop on hand hygiene was organized for students by Hospital Infection Control (HIC) unit, Microbiology. (iii) Poster competition was organized on World hand hygiene day and best posters were displayed in various areas of the hospital. The training was conducted for a period of one week following which, the students were distributed the post-training questionnaire. The questionnaire distributed in pre and post-test/training evaluation and group of students were the same. Finally the pre and post training data was analyzed and responses was tabulated (Tables 1–3).

#### Ethics

The approval from the Institutional Ethical and Research Committee was obtained before conducting the study.

#### Statistical analysis

SPSS software version 19.0 (IBM, SPSS statistics) was used for statistical analysis. Chi-square test was performed for data anal-

ysis. The p values below 0.005 were considered to be significant. Statistical analysis of the data was done and it was found to be statistically significant for all the parameters (Knowledge, attitude and practice).

## Results

A total of 152 medical students participated in the study. Amongst the total participants, 44.44% were males and 55.56% were females. The students were between the age group of 20–22 years. These were students who had come to the third semester of their medical studies and were allotted clinical postings in various sections of the Hospital such as Medicine ward, Surgery ward, Obstetrics and Gynecology, TB and Chest ward, Pediatric ward, Skin and Venereal Disease clinic.

The different questions asked along with their correct responses are given in Tables 1–3. Comparing the pre and post training responses, it was observed that the knowledge component significantly increased on post training evaluation regarding correct steps of hand hygiene (98.68%). Similarly, few other areas which showed improvements (98–100%) after training sessions were knowledge regarding duration of hand hygiene, role of hand washing over hand rub for soiled hands and knowledge regarding cross infection and effectiveness of hand rub.

Regarding the evaluation of attitude towards hand hygiene, it was observed that the majority of students (>90%) had positive attitude but this increased to almost 98–100% after training (Table 2). There was also significant increase regarding the practice element of hand hygiene on post training evaluation for all the five moments as per WHO recommendation. The questionnaires along with their responses are shown in Table 3. The students' responses to the majority of the questions (19 out of 22 questions) significantly improved after the training.

## Discussion

In the present study, the third semester medical students had a good knowledge regarding many aspects of hand hygiene, which was a positive finding. However, the knowledge component in some areas was lacking. A study carried out by Nair et al. [1] reported that the nursing students practiced hand hygiene better than medical students though the knowledge component was better among the medical students. Similarly, Feather et al. studied the hand hygiene practices of 187 medical students and found that only 8.5% of candidates washed their hands after patient contact, although the figure rose to 18.3% when hand hygiene signs were displayed [13]. The situation in healthcare centers of developing countries is even more unacceptable [14]. In an earlier study from Saudi Arabia, adherence to hand hygiene was seen in 70% of medical students, 18.8% of nurses, and 9.1% of senior medical staff, but the technique was suboptimal in all [15]. A study by Mortel et al. in 2010 compared the hand hygiene knowledge, beliefs, and practices between nursing and medical students. They found that the hand hygiene knowledge was significantly higher in nursing students than that of medical students [16].

Kadi et al. reported 56% of medical students correctly identified indications for hand hygiene outlined in the questionnaire, and 44% students were either unaware or not sure about these moments [17]. Mann et al. reported awareness in only 56% of students [18]. In our study, knowledge regarding correct steps of hand hygiene as per WHO "My five moments of hand hygiene" protocol was not adequate in 22.36% students on pre training evaluation which significantly increased to 98.68% after the training program. Similarly, knowledge of students regarding constituents of hand rub and duration of surgical scrub increased to 98.03% and 93.42% respectively post training. Introduction of alcohol-based hand rubs

and continuous educational programs are key factors to overcome infrastructure barriers and to build solid knowledge improvement [4]. The awareness regarding cross transmission of pathogens such as Methicillin Resistant *Staphylococcus aureus* (MRSA), Vancomycin Resistant *Enterococci* (VRE) & Multi drug resistant (MDR)-Gram Negative bacteria (GNB), via contaminated hands also increased (88.81%) after teaching. The hands of HCWs are commonly colonized with pathogens like MRSA, VRE, MDR-GNBs, *Candida* spp. and *Clostridium difficile* [4]. Approximately  $10^6$  skin epithelial cells containing viable microorganisms are shed daily from the normal skin which can contaminate the gowns, bed linen, bedside furniture, and other objects in the patient's immediate environment [6]. Hand carriage of resistant pathogens has repeatedly been shown to be associated with nosocomial infections [2]. Hence their knowledge needs to be strengthened regarding importance of hand hygiene.

Knowledge regarding the role of hand hygiene in reducing cross infection and effectiveness of hand rub was seen in 95.39% and 93.42% students respectively, showing significant improvement after training sessions. Hand hygiene reminders in the form of demonstrations, role play on "World hand hygiene day", flyers, mailers and posters etc. play a decisive role in motivating individuals to adhere to etiquettes. Persistence and perseverance is the key in achieving best practices in healthcare. Most of our students had a positive attitude towards hand hygiene after training and started practicing hand hygiene for all 5 moments and increase adherence was observed towards practicing other parameters also (Table 2).

The importance of hand hygiene is being continuously exemplified and it has been proved by our study that training sessions has resulted in significant improvement in knowledge, attitude and practice of hand hygiene among the medical students. High priority should also be given to hand hygiene as a research topic, through good quality, randomized, controlled trials to determine its impact on HCAs.

Our study highlights the importance of education and training of medical students regarding hand hygiene practices as soon as they enter the 3rd semester. Targeting the 3rd semester medical students has a positive benefit as young minds can be molded easily and moreover this is the point of contact of these students to the patient and hospital environment. HICC shall also conduct such hand hygiene training sessions and workshops regularly for each batch of students so that this improvement is maintained with continuous monitoring and performance feedback. This will encourage the students to follow correct hand hygiene practices and set a trend in the Hospital which will ultimately help towards reduction of HCAI.

## Limitations

The study has few limitations such as (i) We can only assume that improvements in the students' KAP was due to the training provided, but cannot be certain as improved practices was not evaluated in wards. (ii) Follow up studies was not carried out to assess the long term effectiveness of training. (iii) A comparative study between medical students, nurses and staff can be carried out in future to find out the significant difference of training between groups.

## Conclusion

Our study highlights the importance of training sessions on awareness of hand hygiene. Such educational intervention regarding hand hygiene should be conducted more frequently and for each batch of students by organizing workshops and hand hygiene focused programs such as celebration of "World hand hygiene day" on 5th May every year. Further, the revision of curriculum of MBBS/MD courses including basic infection control practices such

as hand hygiene is the need of an hour to reduce health care associated infections.

### Funding

No funding sources.

### Competing interests

None declared.

### Appendix A.

HOSPITAL INFECTION CONTROL LABORATORY  
DEPARTMENT OF MICROBIOLOGY, SUBHARTI MEDICAL COLLEGE  
QUESTIONNAIRE FOR KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) ANALYSIS ON HAND HYGIENE

- Q.1) How many steps are involved in hand washing as per WHO ?  
a) 1                      b) 6                      c) 2                      d)3
- Q.2) What are the constituents of hand rub?  
a) 1% alcohol                      b) 70% alcohol + 0.5% chlorhexidine                      c) 0.5% chlorhexidine
- Q.3) What is the duration of surgical scrub?  
a) 20 sec                      b) 3-5 min                      c) 30 min                      d) 1 min
- Q.4) Which flora is removed by hand washing?  
a) Resident flora                      b) Transient flora
- Q. 5)What is the duration of hand washing as per WHO?  
a) 15 min                      b) 25 min                      c) 30 min                      d) 1 min
- Q.6) What is the duration of hand rub as per WHO?  
a) 30 Sec                      b) 15 min                      c) 10 min                      d) 5 min
- Q. 7)If hands are soiled you should do?  
a) Hand rub                      b) Hand washing
- Q. 8)Which of the following pathogens can be transmitted through hands?  
a)MRSA                      b)VRE                      c)ESBL producers                      d)All
- Q. 9)Hand hygiene reduces:  
a) Cross infection                      b) Iatrogenic infection
- Q. 10)Ultimate goal of hand hygiene is to reduce:  
a) Health care associated infection  
b) Infection to health care worker only  
c) Infection to patients only
- Q.11) Jewellery is a potential source of colonization and transmission of potential pathogens? Yes/No
- Q.12) Hand rubbing is more effective against micro-organisms than hand washing? Yes/No
- Q.13) Do you carry hand rub in your pocket? Yes/No
- Q. 14)Infection control team has a positive influence on your hand hygiene ? Yes/No
- Q.15) Do you think hand hygiene is an essential part of your role? Yes/No
- Q.16) Infection control banners remind you of hand hygiene ? Yes/No
- Q.17)Do you forget to maintain hand hygiene? Yes/No
- Q.18) Following are WHO recommended 5 moments of hand hygiene. You follow hand hygiene for which moment?  
a) Before touching a patient                      Yes/No  
b) Before aseptic procedure                      Yes/No  
c) After body fluids exposure                      Yes/No  
d) After touching a patient                      Yes/No  
e) After touching patient's surroundings                      Yes/No
- Q.19) Do you adhere to correct steps of hand hygiene everytime? Yes/No
- Q.20) Do you guide others to follow hand hygiene? Yes/No
- Q.21) Do emergencies and other priorities make hand hygiene more difficult? Yes/No
- Q.22) Do you feel guilty if you omit hand hygiene? Yes/No

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