

Hand hygiene in reducing transient flora on the hands of healthcare workers: An educational intervention

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Abstract

Aim: Hand hygiene has now been recognised as one of the most effective intervention to control the transmission of infections in a hospital and education is an important tool to ensure its implementation. In order to convince the users and as a part of education, it is important to generate evidence on the role of hand hygiene in reducing the bacterial flora on their hands. The present study was undertaken in a tertiary care hospital to demonstrate the presence of bacterial flora on the hands of healthcare workers (HCW) in different categories, to teach them proper hand hygiene technique using alcohol-based hand rub and determine the outcome for reduction of bacteria. **Materials and Methods:** A total sample size of 60 subjects including resident doctors, medical students, nurses and hospital attendants were included in the study after obtaining informed consent. Each person was educated on the technique of hand hygiene with alcohol-based hand rub and hand impressions were cultured before and after hand hygiene. All the subjects were also given a questionnaire to assess their perception on hand hygiene. The WHO posters on proper hand hygiene were displayed in the appropriate areas of the hospital in addition, as an educational tool. **Results:** Majority (42 out of 60) of the HCWs had bacterial count up to 100 colonies or more on both hands before the application of hand rub while working in the hospital. After use of alcohol hand rub with a proper hand hygiene technique, it was found that the percentage reduction was 95-99% among doctors and nurses, 70% among hospital attendants and 50% among sanitary attendants. *Staphylococcus aureus* was present on the hands of eight persons of which three were methicillin-resistant *Staphylococcus aureus*. **Conclusions:** The study demonstrates that transient bacteria are present on the hands of HCWs but majority could be removed by proper hand hygiene, which needs continuous education to be effective. It also shows that active education by demonstrating the proper hand hygiene technique and direct observation of the practices, though demanding, are ideal to understand the attitudes and practices of HCWs and helps in planning implementation strategies.

Key words: Alcohol rub, education, hand hygiene

Introduction

Healthcare-associated infections (HAIs) are a major concern in the hospitals. The HAIs has increased the morbidity and mortality of the patients and are responsible for increase in the cost of treatment, prolong the hospital stay, and increase the cost of healthcare, all over the world. HAIs are also responsible for increase in the transmission of multidrug-resistant organisms (MDRO) in a healthcare organisation.

The mode of transmission of HAIs is important to understand in a hospital setting so that the implementation of control measures can be designed to achieve effective control. Many interventions are recommended and the strength of association of the measures with evidence of effective control is published by CDC.^[1]

Hand hygiene has now been recognised as one of the most effective intervention to control the transmission of infections in a hospital as well as control of antimicrobial resistance (AMR).^[2]

Transient flora on the hand is mostly acquired from the hospital environment or poor hygiene and is responsible for cross-infections. The common organisms associated are *Staphylococcus aureus* - which can be methicillin-resistant *Staphylococcus aureus* (MRSA), *Klebsiella* sp, *Acinetobacter* sp or any other pathogen which is present in the environment of a healthcare facility.^[3-6]

The proper use of hand hygiene techniques needs continuing education. The display of posters provided by WHO act as effective tools of education. In addition, CME programmes for all level of healthcare providers are important.^[3] The effectiveness of education and its implementation will depend on the level of the healthcare

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worker (HCW) and some may need more individual level teaching to practice correct technique.

The present project was undertaken to study the role of education and interactive teaching in the practice of hand hygiene and demonstrate the reduction of transient bacteria on the hands by adopting such practice.

Ethical approval

The Ethical approval was obtained from the Institute Ethical committee.

Material and Methods

The study was conducted in a tertiary care hospital attached to a Medical College in North India. A total sample size of 60 subjects was included. Fifteen resident doctors, medical students, nurses, hospital and sanitary attendants, who agreed to participate in the study and were on duty in the in an Intensive Care and Medicine Ward of the hospital during the study period, were included. The informed consent was obtained from all the participants of the study i.e. Doctors, Medical Students, Nurses, and Hospital Attendants.

Interactive educational intervention

- Each person included in the study was demonstrated the correct steps of hand hygiene using alcohol-based hand rub available in the hospital at the time.

(Sterillium i.e. 2-propanol 90 g/1000 ml and 1-propanol 60 g/1000 ml, Mumbai, India). They were then requested to perform the steps and hand impressions were collected before and after hand hygiene as described below.

- Teaching Material: In addition to WHO posters on the steps of hand hygiene were also displayed at the prominent sites in the hospital areas.
- Questionnaire: All the subjects were also administered a questionnaire for assessing their perception about hand hygiene and they were analysed using a standard code.

Bacterial culture

The cultures from the hands of all the participants were taken touching all the 10 finger tips on the sheep blood agar plates (Biomerieux) before and after hand hygiene. After incubation overnight the manual colony count was done to sum up all the colonies. Those showing >100 colonies were not counted further.

Identification of bacterial morphotypes was done using Standard Methods and^[7] antimicrobial susceptibility was done for the hospital pathogens that are more likely to be transferred by hands in a healthcare setting and included *S. aureus*, *Enterobacteriaceae*, and *Acinetobacter sp.*

Results

Doctors

The work experience of the 15 resident doctors included in the study is shown in Table 1. Eight doctors were posted in Medicine and 7 in the ICU. All of them were aware through Community Medicine posting or Microbiology Classes or CMEs except two doctors. Thirteen residents practiced hand hygiene before touching the patients; though all of them did so after handling the patients.

Nurses

The work experience of 15 nurses included is shown in Table 1. Eight nurses were posted in the medical ward and seven in the ICU. All of them were aware about hand hygiene, but could not specify any organised source of learning except three nurses who had attended some CMEs. All of them practiced hand hygiene after handling the patients while only 10 nurses practiced hand hygiene before touching the patients.

Medical students

The 15 medical students studying in the 2nd year of Medical College who had started the clinical postings, eight in medical ward, and seven in the O.T were included. All of them were aware about hand hygiene through Microbiology Classes or television except three. Twelve of them practiced hand hygiene after case examination during clinical postings but only nine students practiced hand hygiene before handling the patients.

Attendants

Of the 15 hospital attendants included the experience is shown in Table 1. Two attendants were posted in Microbiology laboratory, two in Pathology laboratory, five in medical ward and three in the ICU. Only nine of them were aware about hand hygiene, but could not specify any

Table 1: Profile of subjects included in the study

	Doctors (15)	Nurses (15)	Attendants (15)	Medical students (15)
Experience (years)				
>5	2	2	9	-
3-5	5	6	4	-
<3	8	7	2	15
Practice of hand hygiene				
Before patient care	13	10	3	9
After patient care/ work	15	15	12	12

organised source. It was found that 12 of them practiced hand hygiene at the end of their work while only three did so before the work. None of them had any formal training on the subject during their posting.

Awareness

Majority of personnel, irrespective of the level of education, were aware of the practice of hand hygiene after, but not before touching patients.

Overall all of them confirmed the availability of soap, water and alcohol-based hand rub in the hospitals but lack of time or attitude was reported to be responsible for non-compliance. Another limitation of practice of soap and water was limited availability of napkins or separate towels after hand wash for drying of the hands.

Bacterial counts

Table 2 depicts the bacterial growth before and after hand hygiene in different categories of the hospital staff. To summarise the table majority (42 out of 60) of the HCWs had bacterial count up to 100 or more in both hands while 18 had less than 100 counts before hand hygiene. Following hand hygiene, the percentage reduction was 95-99% in all except for in attendants where it was 70-90% for lab attendant and only 50% in sanitary attendants [Figure 1].

A total of eight persons carried *S. aureus* on their hands of which three were MRSA [Table 2], five persons had *Klebsiella sp.* or *E. coli* on their hands of which three were ESBL producers, and eight had *Acinetobacter sp.* on the hands of which three were carbapenem resistant. The growth in all these persons was absent after hand hygiene.

Discussion

The presence of transient bacteria carried on the hands of HCWs is significant in persons working in a hospital as the environment and patients are commonly colonised with bacteria. Hand hygiene has been shown to be an effective method to control transmission of infection by reducing the transient flora.^[2-6]

Our study demonstrates that the pathogens are present on the hands but could be removed effectively by proper hand hygiene using alcohol-based hand rub. In the present study 35% of the HCW carried pathogens on the hand and of *S. aureus* 45% were MRSA. Somehow it was observed that despite of personal interaction, sanitary attendants were not able to follow the steps effectively as demonstrated by the bacterial counts after the use of hand rub.

Though there was 95-99% reduction in the bacterial load in majority, the ability to perform correct steps is also dependant on the level of education as the growth of bacteria on the hand was not reduced significantly in the sanitary attendants. This also demonstrates the need of repeated demonstration of the steps and importance of hand hygiene among sanitary attendants.^[8,9]

The other possibility could be that the organic burden on the hands of sanitary workers may be high that might require the use of soap and water first.

This kind of study can be a good module for education. It provides a convincing evidence that the transient flora can be reduced after appropriate hand hygiene. The important aspect which must be considered in all settings is a need for



Figure 1: BEFORE image shows bacterial growth on the thumb and fingersæ impression on sheep blood agar plate. AFTER image shows no bacterial growth on thumb and fingers impression after education and application of alcohol hand rub

Table 2: Analysis of the bacterial growth on the hands of the study subjects n=60

Category of HCW	Bacterial growth in both hand impressions of the fingertips						
	>100 colonies		<100 colonies		Pathogens		
	Before HH	% reduction after HH	Before HH	% reduction after HH	<i>Staph. aureus</i>	Enterobacteriaceae	<i>Acineto-bacter sp.</i>
Doctors	11	>95	4	>95	4 (2 MRSA)	2 (2 ESBL)	4 (3 CR)
Medical students	10	>95	5	>95	0	-	1
Nurses	9	90-95	5	90-95	2 (1 MRSA)	1	3
Attendants	12	50 *-90**	3	50 *-90**	2	2 (1 ESBL)	0
Total	42		18		8 (3 MRSA)	5 (3 ESBL)	8 (3 CR)

*Sanitary attendants, **Laboratory attendants, HCW: Healthcare workers, MRSA: Methicillin-resistant *Staphylococcus aureus*, ESBL: Extended spectrum beta lactamases, CR: Carbapenem resistant, HH: Hand Hygiene

CMEs or induction training at all levels as awareness on use before patient care in lacking and needs strengthening.

The available methods of hand hygiene are soap and water, alcohol-based hand rubs and chlorhexidine-based hand rubs. The advantage of chlorhexidine is the residual activity but it is expensive. Soap and water are economical but need for safe running water and sterile towels to dry hands is a limitation. In a busy hospital alcohol-based hand rubs may help in improving compliance and also maybe cost-effective.^[8]

Conclusion

Hand hygiene is an effective method of reducing the bacterial flora on the hands of the HCWs. In a hospital setting, the hands of the HCWs get colonised with transient flora comprising of pathogenic bacteria. The continuing medical education is one of the most important tools to reiterate the need for hand hygiene and ensure the implementation of the proper hand hygiene at all categories of HCW.

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