Original Article

Hand Hygiene Compliance in the Intensive Care Units of a Tertiary Care Hospital

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ABSTRACT

Context: Hand hygiene (HH) is the most important measure to prevent hospital-acquired infections but the compliance is still low. **Aims:** To assess the compliance, identify factors influencing compliance and to study the knowledge, attitude and perceptions associated with HH among health care workers (HCW). **Settings and Design:** Cross-sectional study conducted in 42 bedded Medical (Pulmonary, Medicine and Stroke) intensive care units (ICU) of a tertiary care hospital. **Materials and Methods:** HCWs (doctors and nurses) were observed during routine patient care by observers posted in each ICU and their HH compliance was noted. Thereafter, questionnaire regarding knowledge, perception and attitudes toward HH was filled by each HCW. **Statistical Analysis:** Percentages and χ^2 test. **Results:** The overall compliance was 43.2% (394/911 opportunities). It was 68.9% (31/45) in the intensivists, 56.3% (18/32) in attending physicians, 40.0% (28/70) in the postgraduate residents and 41.3% (301/728) in the nurses. Compliance was inversely related to activity index. Compliance for high, medium and low risk of cross-transmission was 38.8% (67/170), 43.8% (175/401) and 44.7% (152/340), respectively. **Conclusions:** Compliance of the study group is affected by the activity index (number of opportunities they come across per hour) and professional status. The HCWs listed less knowledge, lack of motivation, increased workload as some of the factors influencing HH.

Keywords: Compliance, hand hygiene, health care workers, hospital acquired infections, intensive care unit

Introduction

Hospital-acquired infections complicate 7-10% of hospital admissions.[1,2] Patients in the intensive care units (ICUs) are more likely to be colonized or infected by harmful and multidrug-resistance micro-organisms and most of these infections are spread by carriage of microorganisms on the health care workers' (HCWs) hands.[3] Hand hygiene (HH) is the single most important measure to prevent this but despite relative simplicity of HH procedures and recommendations; compliance with hand washing is still poor.[4,5] Present study was aimed to know the compliance, to identify the factors influencing compliance and also to assess the knowledge, attitude and perceptions associated with HH among HCWs.

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Materials and Methods

Study design

Cross-sectional.

Settings

The study was carried out in the 42-bedded ICUs (Pulmonary, Medicine and Stroke) of a tertiary care teaching hospital of Punjab after obtaining approval from the hospital ethics committee.

Each ICU is well-equipped with HH facilities. The bottles of an alcohol-based liquid hand disinfectant as well as medicated soap are available at the sinks placed near patient's bedside. The sink to patient-bed ratio is 1:2.

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Inclusion criteria

Patients included all the patients admitted to the ICU during the study period and no stratification was done between the critically ill, ventilated or non-ventilated patients.

Health care workers

HCWs in this study included all physicians on rounds in the ICUs, intensivists, all postgraduate (PG) residents and nurses involved in patient care posted in these ICUs. HCWs were categorized into two categories doctors and nurses for the sake of simplicity. Nurse to patient ratio was 1:2.

Hand hygiene action[3]

Hand washing: It included washing hands with an unmedicated soap or medicated soap (antiseptic hand washing) and water for 1 minute.

Hygienic hand rubbing with an antiseptic solution or alcohol based hand rub using a small quantity (2-3 mL) (handrubbing) for at least 20 seconds till the hands are dry and HH action will include all the recommended steps.

Opportunities

An opportunity was any potential HH action needed during patient care as per recommendations. Opportunities for HH were assessed according to published guidelines[1,3,6]

Opportunities were stratified into three categories with respect to risk of cross-transmission:[6]

High risk for cross-transmission	Before direct patient contact; between care of a dirty and a clean body site, before intravenous or arterial care, before urinary, respiratory or wound care
Medium risk for cross-transmission	After direct patient contact, after intravenous or arterial care, after urinary, respiratory or wound care, and after contact with biological body fluid
Low risk for cross-transmission	Other conditions (bedding, etc).

Observers

One intern each posted in three ICUs were trained as observers and validated before the study during monitoring sessions in which two observers worked simultaneously and inter-rater agreement was high for all variables.

Methodology

Individual HCW was observed during routine patient care by the observers with respect to potential HH opportunities available, number of HH actions performed and total time of observation during each patient care episode. Each HCW was included only once in the study and was not aware of being observed. Observations were distributed over a 2-month period and were made only in day shift.

HH action, whether by hand-washing or alcohol-based hand rubbing, was the main outcome variable. Use of gloves was not considered equivalent to HH adherence unless followed by a HH action according to recommendations. Failure to remove gloves after patient contact between caring for two patients or between a dirty and a clean body site on the same patient was considered nonadherence.[1,3,6]

Questionnaire

After obtaining a written informed consent from the HCW, he or she was asked to fill a preformed questionnaire which included information about age, sex, professional status and questions regarding knowledge, perception and attitudes toward HH. Guidelines from social cognitive theories applicable to health-related behaviors were followed in the construction of the questionnaire.[7,8] Knowledge, attitude and perception toward HH, perception of difficulty in adhering to HH, intention to adhere to HH, and perception of the risk for cross-transmission linked to non-compliance were assessed. In the end of the performa, suggestions to improve HH were asked. Anonymity was guaranteed and after filling of performa, the observers accompanied by one of the investigators, guided the HCW about the missed opportunities and correct method of HH as per recommendations for further implementation.

Statistical analysis

Study variables included age, sex and professional status of the HCW, type of HH opportunity (high, medium, or low risk for cross-transmission), activity index and duration of the observation period. The activity index was estimated by the number of available opportunities for HH per hour of patient care for each HCW observation. Results were analyzed using percentages and χ^2 test using software Statistica.

Results

During the study, a total of 114 HCWs were observed over 79 hrs of observation period, spread over two months, which created 911 HH opportunities. The HCWs comprised of 18 attending physicians, eight intensivists, nine senior residents, 10 PG residents, four non-PG residents, and 65 nurses posted in the ICUs. The mean age of the participants was 37.7 ± 11.22 yrs and 30 ± 5.22 yrs for male and female doctors, and 26 yrs and 29.4 ± 5 yrs for male and female nurses, respectively.

Table 1: Compliance with hand hygiene in relation to age

Age group (years)	Doctors			Nurses		
	n	Opportunities available	HH action performed/compliance (%)	*n*	Opportunities available	HH action performed/compliance (%)
21-30	18	94	38 (40.4)	37	414	172 (41.5)
31-40	16	63	41 (65.1)	28	314	129 (41.1)
41-50	8	14	8 (57.1)	0	-	-
51-60	7	12	6 (50.0)	0	-	-
Total	49	183	93 (50.8)	65	728	301 (41.3)

Age group 21-30 years: P=0.9383 (NS), age group 31-40 years: P=0.1347 (NS). Doctors vs nurses: P=0.3412 (NS)

Total desired HH opportunities during the study period were 911 [728 (79.9%) from the staff nurses and 183 (20.1%) from the doctors]. HH actions actually performed by the HCWs were 394 and overall compliance of the study group was estimated as 43.2%. Ninety-three HH actions were performed by the doctors and 301 by the nurses and the HH compliance in the both groups was 50.8% and 41.3%, respectively [Table 1]. Compliance with HH was lowest (40.4%) in the age group of 21-30 years and maximum (65.1%) in the age group of 31-40 years in doctors, whereas the compliance was comparable in both the age groups (41.5% and 41.1%) in the case of nurses [Table 1].

Compliance was higher in the intensivists 31/45 (68.9%) and attending physicians 18/32 (56.3%) and lower in the PG residents 28/70 (40.0) and nurses 301/728 (41.3), respectively. It was observed that higher the number of HH actions required lower was the compliance as in the case of nurses and PG residents [Table 2].

Compliance with HH was lower (38.2%) when the activity index was high (>20) and higher (52.1%) when activity index was low (<10). However, the difference in compliance between the three categories is not statistically significant [Table 3].

Compliance for medium and low risk of cross-transmission was relatively higher (43.8% and 44.7%, respectively) than that for high level of risk of cross-transmission (38.8%) [Table 3].

Table 4 shows the subjective responses of HCWs to the questionnaire regarding the knowledge, attitude and perceptions toward HH.

Table 2: Compliance to hand hygiene in relation to professional status

Professional status	N	Opportunities available	HH action performed	Compliance (%)
Nurses	65	728 (79.9)	301	41.3
Non-PG residents	4	12 (1.3)	5	41.6
PG residents	10	70 (7.7)	28	40.0
Senior residents	9	24 (2.6)	11	45.8
Intensivists	8	45 (4.9)	31	68.9
Attending physicians	18	32 (3.5)	18	56.3
Total	114	911	394	43.2

Figures in parenthesis indicate percentages

Table 3: Compliance with hand hygiene in relation to activity index and risk of cross transmission of infection

	Activity index			Risk of cross-transmission of infection		
	>20	10-20	<10	High	Medium	Low
Opportunities available (*n*=911)	428 (47.0)	295 (32.4)	188 (20.6)	170 (18.7)	401 (44.0)	340 (37.3)
HH action performed (Compliance)	164 (38.2)	132 (45.0)	98 (52.1)	67 (38.8)	175 (43.8)	152 (44.7)

Figures in parenthesis indicate percentages

Discussion

Nosocomial infections occur worldwide and affect both developed and resource-poor countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients.

Semmelweis observed that normal hand washing did not always prevent the spread of fatal infection and recommended hand disinfection in a solution of chlorinated water before each vaginal examination.[9] Since then careful hand washing between care of patients remains one of the most important measures for preventing the spread of pathogens in hospitals. In the present study overall compliance of the study group was 43.2% and it was more in doctors (50.8%) than nurses (41.3%). Pittet *et al.*[4] observed compliance of 48% and nurses had the highest hand washing adherence rates (52%), while physicians were the worst offenders (23%).

In another study of the 5639 opportunities for HH, 3383 (59.9%) were properly performed and overall rates of compliance were 66.1% for doctors, 60.7% for nurses and 38.6% for paramedical staff.[10]

Maximum opportunities and lowest compliance (40.4%) was seen in age group 21-30 years which may be due to more number of subjects and increased workload on this age group both in case of nurses and doctors

Table 4: Knowledge, beliefs and perception associated with hand hygiene

Question	Response (%)			
	Doctors		Nurses	
	Yes	No	Yes	No
Knowledge about hand hygiene recommendations	82	18	59	41
Performance of hand hygiene during patient care as recommended	71	29	63	37
Compliance to hand hygiene recommendations perceived as easy	46	54	37	63
Perception about hand hygiene as a useful measure to prevent health care associated infections	89	11	75	25
Perception about their colleagues performing hand hygiene according to recommendations	32	68	21	79
Belief that their behaviour is taken as example by their colleagues	27	63	18	82
Knowledge about non-compliance with hand hygiene during patient care imply a risk of cross infections	93	7	87	13
Perception of a need to improve their compliance to hand hygiene	68	32	59	41
Belief that they can improve their compliance to hand hygiene	76	34	56	44

[Table 1]. Nurses came across highest number (79.9%) of the HH opportunities while compliance was higher in the intensivists (68.9%) and in attending physicians (56.3%), which may be due to decreased number of opportunities in the later group [Table 2]. Compliance was lower (38.2%) when the activity index was high (>20) and higher when activity index was low [Table 3]. This shows that higher the number of opportunities available, lower is the compliance as was also seen in other studies.[4-6,8,11] So, the high compliance in the intensivist and attending physician group may reflect decreased number of opportunities available.

The compliance for medium and low risk for cross-transmission was relatively higher than that for high level of risk for cross-transmission. These results are comparable to other studies.[6,10] So high workload and opportunities for HH related to a high risk for cross-transmission were associated with reduced adherence.

In response to the questionnaire, 82% of doctors and 59% of nurses claimed to have knowledge about HH recommendations. When asked whether they were practicing HH according to recommendations, 71% of doctors and 63% of nurses gave positive responses whereas actual compliance obtained from the study was low. Higher number of HCWs perceived HH as useful measure to prevent hospital-acquired infections yet the knowledge was not converted to actions. 54% of doctors and 63% of nurses felt difficulty in following HH recommendations. Only 32% of doctors 21% of nurses thought that their colleagues performed HH according to recommendations. 93% of doctors and 87% of nurses knew that non-compliance to HH during patient care imply a risk of cross-infections. A high proportion of HCWs indicated a positive attitude toward HH. 68% of doctors and 59% of nurses expressed that they were motivated to improve their adherence level, which indicates that we need to work on this aspect.

In response to the question about the cause of low adherence, HCWs attributed it to lack of motivation, lazy attitude, work overload, less time in emergency situations, administrative apathy, lack of knowledge and allergy to soap/hand rub, etc. Important suggestions given by the participants for improving compliance included more education programs, demonstrations of correct technique of HH, regular monitoring and feedback, posters containing educational messages and demonstrating correct techniques to be displayed at various places, and active involvement of the administration.

The Centers for Disease Control and Prevention's (CDC's) Healthcare Infection Control Practices Advisory Committee (HICPAC) published its comprehensive Guidelines for HH in healthcare settings in 2002. The guideline recommended that healthcare facilities develop multidimensional programs to improve HH practices.[12] Recognizing a worldwide need to improve HH in healthcare facilities, the World Health Organization (WHO) launched its Guidelines on Hand Hygiene in Health Care (Advanced Draft) in October 2005. These global consensus guidelines reinforce the need for multidimensional strategies as the most effective approach to promote HH.[13,14]

Conclusions

Increased HH opportunities, increased activity index, increased risk of cross-transmission, lack of knowledge, lack of motivation, less time in emergency situations, etc. came out as the reasons of low compliance. Although the HH procedure is simple, its application by HCW is a complex phenomenon that is not easily explained or changed. A multidimensional approach targeting these issues is needed and efforts should be made to try the best combination that suits the requirement of a particular institution. Hospital administrators should strive to create an organizational atmosphere in which adherence to recommended HH practices is considered an integral part for providing high quality health care.

Limitations

Absence of a control group, exclusion of other areas like casualty, operation theatre, wards, etc, small sample size, improvement in compliance due to awareness of being observed after interaction with colleagues who

had already participated in the study and absence of interventions at any stage could be some of the limitations of the study.

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