

Hand hygiene compliance and associated factors among health care workers in a tertiary care hospital: Self-reported behaviour and direct observation

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Abstract

The objective of the present study was to determine the baseline hand hygiene (HH) compliance rate encompassing all clinical departments of a government sector tertiary care hospital and to determine the factors affecting HH compliance. This was a cross sectional study on knowledge, attitude and practice on HH compliance. The majority of HCWs self reported that they knew about six steps of HH (96%) and five moments for HH (89.3%). However only 47.9% knew the right duration of HH with alcohol hand rub and 13.3% had knowledge that all five moments of HH are equally important. Among respondent doctors, the most common reported reason for not practicing HH was non- accessibility of sinks or alcohol based hand rub at point of care; amongst nurses it was the belief that their hands are not dirty or HH is not so important for every patient. On being asked why they practice HH, only 8% reported being motivated by their colleagues. A total of 342 HH opportunities were observed and overall HH compliance was found to be 14.6%. The necessary infrastructure of the hospital was surveyed for optimal HH practices. It was observed that at many places sinks were not easily accessible and there was no facility to dry hands after HH. Alcohol based hand rubs were present but not easily accessible. Posters illustrating HH techniques were present only at few places. This study clearly shows that there is a need for the development of strategies to improve HH compliance in HCWs.

Keywords: Hand hygiene, compliance, knowledge, attitudes, India

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Introduction

Effective hand hygiene compliance in hospitals plays a key role in improving patient and provider safety, and in preventing the spread of healthcare-associated infections (HAIs). The present study utilized the tools and methodology developed by the World Health Organization (WHO) to measure HH compliance rate and identified factors associated with non-compliance with HH.

Background

Hand washing refers to the action of washing hands with an un-medicated detergent and water, or water alone, to remove dirt and transient flora to prevent cross transmission.¹ Hygienic hand washing refers to the same procedure when an antiseptic agent is added to the detergent.¹ The hands of health workers (HCWs) are the most common modes of transmission of micro-organisms from one patient to another, from one area of the patient's body to another, and from a polluted environment to patients.² Therefore the practice of HH is the simplest and most effective strategy to prevent and control HAIs and spread of multi drug resistance organisms (MDRO) in healthcare settings.

The WHO has developed evidence based guidelines on HH in healthcare to support healthcare facilities to improve HH and thus reduce HAI.³ Despite this, various studies have found that the compliance to HH among HCW is unacceptably low, especially in developing countries.⁴ It is a great challenge to implement WHO guidelines for HH in a healthcare facility, and the first step to implementing a comprehensive HH programme is to conduct baseline evaluation of HH practice, perception, knowledge and the infrastructure available in a healthcare organization.

Studies performed in India have shown HH compliance rates ranging from 26% to 80%.^{5,6} However most of these studies have been limited to selective departments of the hospital or convenience samples of HCW. To the best of our knowledge there is no study of baseline rates of HH compliance in public sector hospitals in India and factors affecting it. The objective of the present study was to determine the baseline HH compliance rate encompassing all clinical departments of a government sector tertiary care hospital among all types of HCWs, and to determine the factors affecting HH compliance.

Material and Methods

This was a cross sectional study on knowledge, attitude and practice (KAP) on HH compliance, conducted at Safdarjung Hospital (SJH), Delhi, from October to November, 2015. Safdarjung Hospital is a 1531 bed, tertiary care, government hospital situated in Delhi. Its catchment area includes Delhi and neighbouring states with daily out-patient department visits and in-patient admissions of 9538 and 434 respectively. This multi-specialty hospital has eight ICUs and 41 wards of 21 clinical departments. The study population was all HCWs (including doctors, nurses, trainees, technicians etc) who were working in SJH.

For this study, the investigator visited all ICUs and clinical departments of SJH at least twice during the one-month period of the study and in each of these wards/ ICUs. All HCWs who were present during an hour-long visit of the investigator were questioned and observed by the investigator.

To assess the knowledge and attitudes regarding HH practices, a closed-ended structured questionnaire was given to the HCWs. The questionnaire was adapted from the WHO-developed questionnaire based on their HH knowledge and perception survey⁷ and the modified version was initially piloted in a small group of HCWs.

The practice of HH was evaluated by a single investigator using the direct observation technique described in the WHO hand hygiene technical reference manual (HHTRM).⁸ The WHO HH observation form [WHO HHTRM] was used to evaluate HH by the investigator. The investigator observed practices and gathered data on HH using the five indications in line with the methodology and instructions specified in the WHO HHTRM.⁸ The observations were made during the day shift only (between 9 am to 4 pm) and each observation session lasted 20-30 minutes.

The investigator also noted the availability of infrastructure necessary for optimal HH compliance. This includes access to safe and continuous water, soap, single use towel at each sink, sink: bed ratio, nurse: bed ratio and availability of alcohol based hand rub at point of care. The data obtained were analyzed according to the recommendations of WHO HHTRM.⁹

Table 1. Knowledge about hand hygiene

	Doctors (n=36) % (n)	Nurses (n=39) % (n)	Total (n=75) % (n)
Training on HH in the last year?			
Yes	47.2 (17)	64.1 (25)	56 (42)
No	52.8 (19)	35.9 (14)	44 (33)
Do you know the 6 steps of HH?			
Yes	97.2 (35)	94.9 (37)	96 (72)
No	2.7 (1)	5.1 (2)	4 (3)
Do you know the 5 moments for HH?			
Yes	86.1 (31)	92.3 (36)	89.3 (67)
No	13.8 (5)	7.6 (3)	10.7 (8)
Which is/are the most important moment of HH?			
Moment 1 (Before touching patient)	80.5 (29)	66.7 (26)	73.3 (55)
Moment 2 (Before clean/aseptic procedure)	33.3 (12)	48.7 (19)	41.3 (31)
Moment 3 (After body fluid exposure)	41.7 (15)	35.9 (14)	38.7 (29)
Moment 4 (After touching patient)	44.4 (16)	51.2 (20)	48.0 (36)
Moment 5 (After touching patients surrounding)	22.2 (8)	10.3 (4)	16.0 (12)
All five moments	16.7 (6)	10.3 (4)	13.3 (10)
What is the minimal time needed for alcohol based hand rub to kill germs on your hands?			
20 s	58.3 (21)	35.9 (14)	47.9 (35)
Others	36.1 (13)	64.1 (25)	52.1 (38)
Which one is the main route of cross transmission of micro-organism between patients?			
Air	0 (0)	7.7 (3)	4 (3)
HCWs' hands	86.1 (31)	79.5 (31)	82.7 (62)
Exposure to colonized surface	13.9 (5)	2.6 (1)	8 (6)
Sharing non-invasive objects	0 (0)	5.1 (2)	2.7 (2)

Participation in the study by healthcare staff was on voluntary basis. The confidentiality of the participant was maintained by avoiding use of names or other identifying information. The Investigator respected the patients' privacy and did not interfere with healthcare activities being carried out during the session. The observations were avoided in extreme situations, like during emergency medical treatment, since these may not reflect a standard health care situation.

Results

A total of seventy-five HCWs (36 physicians and 39 nurses) responded to the self-administered questionnaires. It was found that 56% HCWs received training in the last one year on HH practices. The majority of them self-reported that they knew about the six steps of HH (96%) and five moments for HH (89.3%). However only 47.9% (35/75) knew the right duration of HH by alcohol hand rub (20 seconds) and 13.3% (10/75) had knowledge that all five moments of HH are equally important. Eighty three percent

Table II. Reasons for not following hand hygiene

	Doctors (n=36) % (n)	Nurses (n=39) % (n)	Total (n=75) % (n)
Non accessibility of sink or the alcohol based hand rub	44.4 (16)	10.2 (4)	21.3 (16)
I forgot	33.3 (12)	10.2 (4)	16 (12)
Damages skin and cause irritation	11.1 (4)	20.5 (8)	13.3 (10)
My hands are not dirty	5.6 (2)	25.6 (10)	14.8 (11)
It is not so important in every patient	0 (0)	25.6 (10)	13.3 (10)
I do not have time	5.6 (2)	12.8 (5)	9.3 (7)
Patients get offended by my washing hands after touching them	0 (0)	7.7 (3)	4 (3)
Other colleagues do not practice HH	0 (0)	2.6 (1)	1.3 (1)

Table III. Reasons for following hand hygiene

	Doctors (n=36) % (n)	Nurses (n=39) % (n)	Total (n=75) % (n)
For patient safety	69.4 (25)	66.7 (26)	68 (51)
Want to prevent an outbreak in the hospital	27.7 (10)	30.8 (12)	29.3 (22)
Have received training on hand hygiene	25 (9)	23.1 (9)	24 (18)
Want to protect me and my family at home	25 (9)	15.4 (6)	20 (15)
Due to presence of Infection Control personnel	13.8 (5)	17.9 (7)	16 (12)
Motivated by my colleagues	13.8 (5)	2.5 (1)	8 (6)
Posters of HH remind me	5.6 (2)	0 (0)	2.7 (2)

(62/75) of the HCWs knew that their hands are the most common route of cross transmission of infections (Table I).

Among respondent doctors, the most common reported reason for not practicing HH was non-accessibility of sinks or alcohol based hand rub (in 44%) at point of care, followed by not remembering to follow HH (in 33%). However respondent nurses reported that they do not practice HH as they believe that their hands are not dirty (25.6%), or HH is not so important in every patient (in 25.6%). Twenty one percent of respondent

nurses were also apprehensive of skin irritation caused by frequent HH (Table II).

On being asked why they practice HH (Table III), 68% of respondents reported their concern about the patient's safety. However only 8% reported of being motivated by their colleagues and 2.7% were reminded by HH posters.

A total of 69 HCW (day shift only) were observed in different wards and ICUs over a period of one month. A total of 342 HH opportunities were encountered

Table IV. Hand hygiene compliance rate among HCWs at Safdarjung Hospital

Locations	No of observed HCWs	Doctors % (Ac/Op)	Nurses % (Ac/Op)	Others % (Ac/Op)	Total % (Ac/Op)
Nursery & Neonatal ICU	4	63.6 (7/11)	14.3 (1/7)	-	44.4 (8/18)
Respiratory ICU	2	50.0 (5/10)	33.3 (1/3)	-	46.1 (6/13)
ICU2	3	40.0 (2/5)	0 (0/5)	57.1 (4/7)	35.2 (6/17)
ICCU	3	37.5 (3/8)	0 (0/2)	50.0 (1/2)	33.3 (4/12)
ICU1	5	25 (4/16)	11.1 (1/9)	0 (0/5)	16.7 (5/30)
Burns ICU	3	0 (0/3)	8.3 (1/12)	0 (0/2)	5.9 (1/17)
Nephrology	2	42.8 (3/7)	50 (1/2)	-	44.4 (4/9)
Oncology Ward	4	22.2 (4/18)	50 (2/4)	-	27.3 (6/22)
Burns Ward	3	0 (0/4)	10 (1/10)	-	7.2 (1/14)
Surgery Ward	3	9.0 (1/11)	0 (0/4)	-	6.7 (1/15)
Cardiology Ward	3	0 (0/6)	11.1 (1/9)	-	6.6 (1/15)
Urology Ward	4	10 (1/10)	0 (0/7)	-	5.8 (1/17)
Medicine Ward	7	4.3 (1/23)	8.3 (1/12)	-	5.7 (2/35)
Dermatology Ward	4	10 (1/10)	0 (0/9)	-	5.2 (1/19)
Orthopaedics Ward	4	6.3 (1/16)	0 (0/2)	0 (0/1)	5.2 (1/19)
Paediatric Ward	5	4.5 (1/22)	0 (0/4)	-	3.8 (1/26)
Obs & Gynae Ward	7	3.5 (1/28)	0 (0/7)	-	2.8 (1/35)
CTVS & Neurosurgery	1	0 (0/0)	0 (0/3)	-	0 (0/3)
Eye/ENT Ward	2	0 (0/5)	0 (0/1)	-	0 (0/6)
Total	69	16.1 (35/213)	8.9 (10/112)	29.4 (5/17)	14.6 (50/342)

Ac= Action done, Op= Opportunities for HH generated, HCWs= Health care workers

and overall HH compliance was found to be 14.6%. The HH compliance in all the ICUs and nursery and neonatal ICU was 28% (30/107) as compared to wards 8.5% (20/235). The HH compliance rate was higher in doctors (16.1%) when compared to nurses (8.9%) (Table IV).

On comparing the five moments of HH, it was observed that the highest HH compliance was seen after blood and body fluid exposure (28.1%), and the lowest after touching patient surroundings (7.1%) (Table V). In all instances of HH, the hand rubbing action 7.8%

(27/342) was higher than the hand washing action 6.7% (23/342).

The necessary infrastructure of the hospital to support optimal HH practices was surveyed. In the wards (n=16), it was observed that the nurse to bed ratio ranged from 1:3 to 1:16. There were hand operated sinks with soap and a regular supply of clean water in most of the wards. However none of the sinks were easily accessible. Single use hand towels for drying hands after hand washing were not present in any of the wards. Alcohol based hand rubs were present in all

Table V. Hand hygiene indications and compliance rate among HCWs at Safdarjung Hospital

Five moments of HH assessed	Compliance rate Hand Wash % (Ac/Op)	Compliance rate Hand Rub % (Ac/Op)	Compliance rate Total % (Ac/Op)
Before touching a patient	2.3 (3/126)	5.5 (7/126)	7.9 (10/126)
Before clean/aseptic procedure	8.6 (11/127)	11.8 (15/127)	20.4 (26/127)
After body fluid exposure risk	18.8 (6/32)	9.3 (3/32)	28.1 (9/32)
After touching a patient	6.6 (1/15)	6.6 (1/15)	13.3 (2/15)
After touching patient surroundings	4.7 (2/42)	2.3 (1/42)	7.1 (3/42)
Total	6.7 (23/342)	7.8 (27/342)	14.6 (50/342)

Ac= Action done, Op= Opportunities for HH generated

but one of the wards (one of the gynaecological wards) but these were also not easily accessible (except for the oncology ward). Posters illustrating hand wash or hand rub techniques were only present in two of the wards (nephrology ward and one of the medicine wards).

In five ICUs of the hospital, the nurse to patient ratio was 1:2 to 1:3. Hand operated shallow sinks were seen in three ICUs and elbow operated deep sinks in two ICUs. These sinks were easily accessible. Single use hand towels were found in ICU2 while alcohol based hand rubs were present at each bedside in all ICUs except the ICCU. Posters illustrating hand wash or hand rub techniques were observed in two ICUs (burns ICU and ICU2).

In the nursery and neonatal ICU, the nurse to patient ratio was 1:6 to 1:7. Elbow operated deep sinks were seen but not easily accessible. Alcohol based hand rubs were present at every bed/cot. Hand hygiene posters were also displayed.

Discussion

Effective hand hygiene compliance in hospitals plays a key role in improving patient and provider safety, and in preventing the spread of HAI. The WHO "my five moments for hand hygiene"³ represents a standardized approach for training, implementation, monitoring and reporting of HH compliance.

The present study utilized the tools and methodology developed by the WHO to measure HH compliance rate and identified factors associated with non-compliance with HH. In contrast to other studies conducted in different parts of the country where HH compliance was measured in selective locations of the hospital or on convenience samples of HCWs, this study assessed HH compliance rates in all clinical departments of the hospital and among all categories of HCWs working in the hospital.

The level of HH compliance rate among HCWs working in SJH is alarmingly low (14.6%). This finding is lower than the compliance rates reported in similar studies from various developing countries including Vietnam (47%), Thailand (6.3% to 81.2%), Argentina (23.8% to 64.8%), and Mexico (45% to 79%).^{4,10-12}

There are several explanations as to why HH compliance is lower in SJH. Although more than 90% of HCWs self-reported having knowledge of the six steps of HH and the WHO five moments of HH, only 48% of HCW reported the right duration of HH by alcohol hand rub (20 seconds) and even fewer (13%) reported that all moments of HH are equally important to prevent transmission of HAI. This underscores the need for regular refreshing of the mode and content of education and training programmes on HH practices.

Table VI. Ward/ ICUs infrastructure survey for optimal hand hygiene practice

	Wards n=16	ICUs n=5	Nursery & NICU n=4	Total n=25
Nurse to bed ratio	1:3 to 1:16	1:2 to 1:3	1:6 to 1:7	-
Sink to bed ratio	1:11 to 1:40	1:1 to 1:10	1:9 to 1:23	-
Easy accessibility of hand washing sink	0/16	4/5	2/4	7/25
Type of hand washing sink				
Deep	7/16	3/5	1/4	11/25
Shallow	9/16	2/5	3/4	14/25
Elbow operated	0/16	2/5	3/4	5/25
Hand operated	16/16	3/5	1/4	20/25
Availability of soap	14/16	5/5	4/4	23/25
Availability of disposable towel	0/16	1/5	0/4	6/25
Easy availability of hand rub	1/16	4/5	2/2	6/23
Availability of posters illustrating hand hygiene practices	2/16	2/5	2/2	4/23
Availability of regular supply of clean water	16/16	5/5	4/4	25/25

It was also observed that in most parts of the hospital, the necessary infrastructure required to adhere to HH practices, such as the number of sinks, easy accessibility to sinks or alcohol hand rubs, availability of disposable towels, and posters illustrating HH practices as a reminder, is insufficient. System modifications might solve this problem by providing, for example, individual bottles of alcohol-based hand rub solution for pocket carriage, and dispensers available in the immediate vicinity of each patient care location. The observational study performed by Bischo *et al.*¹ showed that compliance with hand hygiene increased after alcohol-based waterless dispensers were made available, initially at a ratio of one dispenser per four beds. Interestingly, compliance was even higher when this ratio was 1:1, stressing the importance of the ease of access. Also visual reminders from posters or signs were cited as motivators to perform HH in the study conducted by White *et al.*¹³

In the present study, only 8% of HCWs are motivated by their colleagues to practice HH. Some authors

have recommended motivation of appropriate HH practices through role modelling and peer pressure from senior medical, nursing and administrative staff.¹³

In present study, the HH compliance rate was comparatively higher in doctors (16.4%) than nurses (8.9%) which is concordance with findings in other studies in India.^{14,15} However, when compared with studies across other countries, the results are conflicting.^{12,16,17} The lower compliance among the nurses in this study may be due to the nurses' beliefs that it is not important to practice HH with every patient (25.6%), or when their hands are not visibly soiled (25.6%). These false beliefs need to be addressed in training sessions of HH. Among nurses, 20.5% were also apprehensive that HH practices can cause skin irritation. This can be addressed by conducting pilot testing of a hygiene product before selecting it. The nurse to patient ratio pointed out that understaffing is also one of the identified factors for low compliance of HH.

The HH compliance rate was higher in ICUs (28%) as compared to wards (8.5%). Among the clinical departments, the highest compliance rate was observed in the nephrology (44.4%) and oncology (27.3%) wards. The patients admitted in these departments are more immuno-compromised as compared to other patients in the hospital. This might be the factor that drives higher compliance rates among HCWs working in these departments, as most of them (68%) self-reported that they practice HH because they are concerned about the safety of patients. Moreover, the necessary infrastructure to practice HH is more appropriate in the ICUs, with easy accessibility of both sinks and hand rubs, presence of visual reminders in the form of posters, and a better nurse to patient ratio.

Furthermore, the majority of the HCWs (73.3%) self-reported that the first and the fourth moments i.e. before touching the patient and after touching the patient (48.0%) are more important moment for HH. The same was observed during HH direct observation also. Hence HCWs need to be reminded repeatedly about the importance of all five moments of HH in education and training sessions, and particular attention should be directed towards HH after touching a patient's surroundings by highlighting that the opportunity for the spread of infection that includes the less intrinsically apparent source of a patient's environment.

The study has certain limitations: The study took place in a relatively short period of time, leading to generation of relatively fewer opportunities in certain clinical areas. As per WHO guidelines, around 20 data points should preferably be obtained before analysing the variation in the process.³ "The general assumption behind this guidance is that a relatively stable distribution of the results starts to form when 15 to 25 data points are generated. When there are fewer

than 15 data points the variation in the process has a tendency to be quite volatile and the probability of improperly representing the current variation due to a type I or type II error increases".³

To conclude, the study provides insights rather than findings that can be generalized. This study shows clearly that there is a need for the development of strategies to improve HH compliance in HCWs. To make HH part of the organizational mantra requires senior clinical and non-clinical leaders to visibly champion and mandate best practice initiatives as well as to articulate that non-compliance to HH is culturally and professionally unacceptable. Also making HH assessments and education an integral part of professional college training and accreditation can raise the profile of and reinforce the importance of HH. Furthermore the infrastructure, especially of the wards, must be re-modelled to provide the necessary requirements for HH. As mentioned by Hugonnet and Pittet, "interventions targeted at individuals are insufficient to induce sustained change, and that other factor such as environmental constraints and the institutional climate need to be taken into account."¹

A future study can then be conducted to assess the impact of recommended interventions. This information can then make ground for the development of effective policies on HH both at local and national level.

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Ethical approval

The study was approved by Institute Ethics Committee.

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