



Hand hygiene non-compliance among intensive care unit health care workers in Aseer Central Hospital, south-western Saudi Arabia



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SUMMARY

Objectives: Hand hygiene is the undisputed single most effective infection control measure. The purpose of the current study was to measure the degree of compliance with hand hygiene practices among health care workers in intensive care facilities at Aseer Central Hospital (ACH), south-western Saudi Arabia.

Methods: Data were collected by direct observation of health care workers in intensive care units delivering routine care, using the standardized World Health Organization method for direct observation “Five moments for hand hygiene” approach. Observations were made during February–April 2011, by well-trained infection control nurses during their routine visits to the units. The moment the observer identified an indication, it was counted as an opportunity to which there should be a corresponding positive or negative action (hand washing).

Results: The present study included 536 opportunities (observations) collected from the intensive care unit (ICU), intermediate care unit (IMCU), cardiac care unit (CCU), and pediatric care unit (PICU) of ACH. Observations covered 179 nurses and 34 physicians working in these units. Overall, hand hygiene non-compliance was observed in 41.0%. The study showed that events before contact with the patient (adjusted odds ratio (aOR) 6.575, 95% confidence interval (CI) 4.461–9.691), being a physician (aOR 1.712, 95% CI 1.126–2.989), and work in the IMCU (aOR 2.140, 95% CI 1.202–3.811) were significant risk factors for hand hygiene non-compliance in the hospital.

Conclusions: The observed high figures of hand hygiene non-compliance warrant intensifying education to promote local hand hygiene and training programs to help embed efficient and effective hand hygiene into all elements of care delivery in the intensive care units of ACH.

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1. Introduction

Hand hygiene has been known to reduce health care-associated infections (HAIs) since Ignaz Semmelweis demonstrated dramatic reductions in puerperal sepsis after instituting a hand washing regimen in the Vienna Lying-in Hospital in 1847.¹

HAIs persist as a major and growing health problem, causing increased morbidity, prolonged hospital stays, and a high number of in-hospital deaths.^{2,3} Hospitalization in an intensive care unit (ICU) further increases the risk of HAIs. Non-compliance with hand hygiene protocols in hospitals, particularly in ICUs, is widely recognized as one of the most important contributing and preventable causes of HAIs. Most ICU-endemic infections result from the carriage of microorganisms on health care workers' (HCWs) hands, and outbreaks of infections due to

cross-transmission are frequent.⁴ Contributing factors are the high intensity of patient care in ICUs, the frequent contacts between HCWs and ICU patients, and the performance of procedures with a high risk of cross-transmission.⁵

The Aseer region is located in the southwest of Saudi Arabia, covering an area of more than 80 000 km². The region extends from the high mountains of Sarawat (with an altitude of 3200 m above sea level) to the Red Sea, and lies a few kilometers from the northern border of neighboring Yemen. The population of Aseer is 1 688 368. The delivery of health services in the southern region is provided by a network of 244 primary health care centers, 16 referral hospitals, and one tertiary hospital, Aseer Central Hospital (ACH). The hospital, with 500 beds,⁶ is run by the Ministry of Health and the College of Medicine of King Khalid University (KKU) Abha.

HAIs constitute a serious disease burden and have a significant economic impact on patients and health care systems throughout the world. Yet good hand hygiene, the simple task of cleaning hands at the right time and in the right way, can save lives. Hand

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hygiene is the undisputed single most effective infection control measure. The purpose of the current study was to measure the degree of compliance with hand hygiene practices among HCWs in the intensive care facilities at ACH.

2. Materials and methods

2.1. Sample size

Using the World Health Organization (WHO) manual for sample size determination in health studies,⁷ at 95% confidence interval (95% CI), with a conservative estimate of the anticipated population proportion of non-compliance of 58% from a similar study,⁸ and with an absolute precision of 5%, the minimum sample size required for the study was calculated to be 375 observations (events). To avoid possible non-response, a total sample of 500 observations was planned for inclusion in the present study.

2.2. Hospital setting

Observations of hand hygiene compliance were conducted in the different ICUs of ACH, Abha, Saudi Arabia during the period February–April 2011. The ICU has 12 beds, the intermediate care unit (IMCU) has 32 beds, the cardiac care unit (CCU) has 15 beds, and the pediatric care unit (PICU) has 7 beds. All of these units are of the closed system. Care is provided by an ICU-based team of critical care physicians, nurses, pharmacists, respiratory therapists, and other health professionals.⁹ HCWs at ACH (similar to those at other tertiary hospitals in Saudi Arabia) are of different cultures, nationalities, and religions.

All of the ICUs follow the same infection control policies and procedures and provide the same staff orientation. Each unit has a single secured entrance. Hand washing facilities are available at a frequency of one sink for every three beds. Alcohol-based hand rub dispensers are available at each ICU entrance, and one dispenser per every two ICU beds is dispersed within each unit. All nursing and allied health staff have received an infection control orientation.

2.3. Direct observation

Data were collected by direct observation (anonymously and confidentially) of the HCWs in the ICUs delivering routine care (in direct contact with patients), using the standardized WHO method for direct observation “Five moments for hand hygiene” approach.¹⁰ The five moments are before touching a patient, before an aseptic procedure, after body fluid exposure risk, after touching a patient, and after touching patient surroundings. Observations were made by well-trained infection control nurses during their routine visits to the units. The moment the observer identified an indication, it was counted as an opportunity to which there should be a corresponding positive or negative action (hand washing).

Observers were infection control nurses at the hospital. All observers were trained for three sessions before starting the actual observations. Observer training involved a 2-h hands-on session. During training, more than one observer was asked to observe actual events in the hospital (not included in the study). Kappa statistics were calculated for each event during training to measure the degree of agreement between trained observers. Groups of observers during training showing low agreement were trained again. The training included how to monitor hand hygiene adherence according to the WHO indication moments for hand hygiene.¹⁰ Actual data collection was performed three times weekly during 2-h sessions. Data were collected by infection control nurses during their routine visits to the units.

2.4. Statistical analysis

The main outcome measured was hand hygiene non-compliance (lack of hand washing) at different moments by different HCWs. Data were coded, validated, and analyzed using SPSS PC+ version 13 software package. Data were presented as frequencies and percentages. The Chi-square test was used, with significance set at the 5% level. Binary logistic multivariate analysis, adjusted odds ratios (aOR), and antecedent 95% CI were used to identify potential risk factors for hand hygiene non-compliance. Factors included in the logistic model were combined events (before contact vs. after contact), involved HCW (physicians vs. nurses and other HCWs) and the unit (IMCU vs. other ICUs).

3. Results

The present study included 536 opportunities (observations) collected from the ICU, IMCU, CCU, and PICU of ACH. Observations covered 179 nurses and 34 physicians and 23 other HCWs (including X-ray and ECG technicians, physiotherapists, and respiratory therapists) working in these units.

Overall, hand hygiene non-compliance (lack of hand washing) was observed in 41.0%. Alcohol rub was observed in 36.2% and hand washing in 22.8%.

Table 1 shows hand hygiene non-compliance by hand hygiene indications (events). The hand hygiene non-compliance increased from 16.9% after patient care to reach 59.3% before patient contact

Table 1
Hand hygiene non-compliance by hand hygiene indications (events), intensive care unit, and health care provider

Variable	Hand hygiene non-compliance, n (%)	p-Value
Hand hygiene indication		
Before patient contact	105 (59.3%)	0.001 ^a
Before aseptic procedure	56 (52.7%)	
After body fluid exposure	8 (30.8%)	
After patient contact	21 (16.9%)	
After contact with patient surroundings	30 (22.7%)	
Unit		
ICU	98 (37.8%)	0.002 ^a
IMCU	46 (52.9%)	
PICU	72 (32.1%)	
CCU	4 (36.4%)	
Health care provider		
Physicians	73 (54.8%)	0.041 ^a
Nurses	88 (32.6%)	
Other health care workers	59 (39.7%)	
HH indication by health care provider		
Before patient contact		
Physicians	28 (51.9%)	0.342
Nurses	53 (60.9%)	
Other health care workers	24 (66.7%)	
Before aseptic procedure		
Physicians	13 (52.0%)	0.015 ^a
Nurses	20 (87.0%)	
Other health care workers	23 (79.3%)	
After body fluid exposure		
Physicians	1 (12.5%)	0.252
Nurses	4 (50.0%)	
Other health care workers	3 (30.0%)	
After patient contact		
Physicians	12 (34.3%)	0.004 ^a
Nurses	5 (8.1%)	
Other health care workers	4 (14.8%)	
After patient surrounding contact		
Physicians	19 (46.3%)	0.001 ^a
Nurses	6 (12.5%)	
Other health care workers	5 (11.6%)	

ICU, intensive care unit; IMCU, intermediate care unit; PICU, pediatric intensive care unit; CCU, cardiac care unit.

^a Significant ($p < 0.05$).

Table 2

Multivariate analysis, adjusted odds ratios (aOR), and antecedent 95% confidence intervals (CI) of potential risk factors determining hand hygiene non-compliance at Aseer Central Hospital, south-western Saudi Arabia

Variable	aOR	95% CI	
		Lower	Upper
Event: ^a before vs. after patient contacts	6.575	4.461	9.691
HCWs: ^a physicians vs. nurses and other HCWs	1.712	1.126	2.989
Intensive care unit: ^a IMCU vs. other ICUs	2.140	1.202	3.811

HCW, health care worker; ICU, intensive care unit; IMCU, intermediate care unit.

^a Significant ($p < 0.05$).

and 72.7% before an aseptic procedure. The difference is statistically significant ($p = 0.001$). Missed opportunities were significantly higher ($p = 0.002$) in the IMCU (52.9%) and ICU (37.8%) compared to the CCU (36.7%) and PICU (32.1%). Hand hygiene non-compliance was significantly higher ($p = 0.041$) among physicians (54.8%) compared to nurses (32.6%) and other HCWs (39.7%). The hand hygiene non-compliance rates were significantly ($p = 0.015$) higher among nurses and other HCWs (87.0% and 79.3%, respectively) compared to physicians (52.0%) before aseptic procedures. On the other hand, the hand hygiene non-compliance rates were significantly higher among physicians compared to the other groups after patient contact and after contact with patient surroundings.

After adjusting for other potential risk factors, the study showed that events before contact with the patient (aOR 6.575, 95% CI 4.461–9.691), being a physician as HCW (aOR 1.712, 95% CI 1.126–2.989), and working in the IMCU (aOR 2.140, 95% CI 1.202–3.811) were significant risk factors for hand hygiene non-compliance in the hospital (Table 2).

4. Discussion

HAIs have a great impact on morbidity, mortality, length of hospital stay, and costs.¹¹ ICUs represent a center of HAIs because of patient characteristics. In particular, the use of various invasive devices is one of the most important risk factors for acquiring HAIs.¹²

The results of the present study indicate an overall high rate of hand hygiene non-compliance of 41% in all ICU types at ACH. Training programs for hand hygiene are regularly performed at the hospital. The high turnover rate observed in the hospital may play a role in this respect. A similar high figure of hand hygiene non-compliance of 40% was reported in 2007 in the hospital critical care areas.¹³

A recent study in the ICUs of the University Hospital in Riyadh, Saudi Arabia revealed an overall observed non-compliance rate of 58%.⁸ In 2010, Erasmus et al.¹⁴ reviewed 65 global studies on compliance in ICUs and found an overall compliance rate of 30–40%; they concluded that non-compliance with hand hygiene guidelines is a universal problem. They also stated that to develop successful interventions, more research into the behavioral determinants of hand hygiene non-compliance is needed.

Patients in different types of ICUs have different care requirements, potentially resulting in different hand hygiene opportunities. In the present study non-compliance rates were significantly highest in the IMCU. Although the nurse-to-patient ratio was the same in all of the ICUs, the physical environment and the conditions involving visitation and staffing were unique in the IMCU setting. Relatives were allowed to accompany patients in the IMCU, and visiting hours were extended compared with the other ICUs.

In the present study, hand hygiene non-compliance differed depending on the five moments of hand hygiene ($p < 0.001$). There

was low hand hygiene non-compliance after body fluid exposure risk (30.8%), after patient contact (16.9%), and after contact with patient surroundings (50%). Higher levels of non-compliance were found before patient contact (59.3%). The event before patient contact has a significant 6 times higher risk of hand hygiene non-compliance compared to the event after patient contact. The WHO found poor levels of compliance before an aseptic task and it is suggested that activities that are high risk to the patient have lower compliance.^{14,15} Allegranzi and Pittet reported that HCW compliance was high when hands were visibly dirty or sticky.¹⁶ These activities have a perceived element of risk to them, for example, after exposure to body fluids. Lower levels of compliance were found across all groups for the moment 'after contact with patient surroundings'. There is growing evidence that the environment and the issue of environmental cleaning and decontamination are important factors in minimizing HAIs. Cleaning of the environment needs to be improved generally, and specifically at hand touch sites. Hand touch sites with the highest risk to patients are those that are next to the patient, for example, bedrails, lockers, over-bed tables, and door handles.¹⁷

The present study showed that the rate of hand hygiene non-compliance was significantly higher ($p = 0.041$) among physicians (54.8%) compared to nurses (32.6%) and other HCWs (39.7%). Previous studies have shown doctors to have generally poor compliance with infection prevention and control standards.¹⁸ Hugonnet et al. found that doctors had the highest level of non-compliance,¹⁹ and in other studies only a third of doctors believed that hand hygiene was necessary before patient contact, and just over half of the doctors believed that it was necessary after patient contact.²⁰ It may be that doctors have a distinct culture associated with levels of power which means that they can be 'difficult'.²¹ Historically, they have been a powerful pressure group and are perceived as being resistant to change, or opposed to threats to their autonomy.¹⁶ Similarly, Ferlie and Shortell stated that doctors often resist efforts to standardize practices and impose rules, as in complying with effective hand hygiene.²² It may be that this cultural aspect affects doctor compliance, and certainly previous studies have indicated that cultural norms have a part to play in HCW compliance.²³ Some studies have looked into the effect of role models on hand hygiene compliance. One study found that hand hygiene behavior of senior practitioners plays a crucial part in influencing junior staff.²⁴ It is suggested that targeting of consultants is the way forward to improve compliance levels.

Religious faith and culture can strongly influence hand hygiene behavior in HCWs and potentially affect compliance with best practices.²⁵ To better understand Muslim HCW attitudes toward alcohol-based hand cleansers in an Islamic country, the study by Ahmed et al.²⁶ conducted in the Kingdom of Saudi Arabia, is very instructive. Interestingly, although Saudi Arabia is considered the historic epicenter of Islam, no state policy or permission or fatwa (Islamic religious edict) was sought for the approval of alcohol-based hand rubs. Indeed, hand rub dispensers have been installed in numerous health care settings since 2005.²⁶ This experience demonstrates that alcohol-containing hand rub solutions are indeed finally acceptable to many Muslim HCWs, even within an Islamic kingdom legislated by Sharia (Islamic law), and this may encourage other Muslims to reconsider their attitude.

In conclusion, the observed high figures of hand hygiene non-compliance warrant intensifying education to promote local hand hygiene and training programs to help embed efficient and effective hand hygiene into all elements of care delivery in the intensive care units of ACH.

Ethical approval: The work was approved by the Ethics Committee of King Khalid University.

Conflict of interest: No conflict of interest to declare.

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