

ORIGINAL ARTICLES

A review on hand hygiene compliance by medical staff of hospitals worldwide

Phan Thi Thu Trang, Nguyen Thi Bich Thao, Nguyen Quynh Anh, Le Tu Hoang

ABSTRACT

Objectives: Hand hygiene among healthcare workers is crucial as their hands can transmit microbes between patients and the environment, leading to hospital-acquired infections (HAIs). HAIs are significant challenges in healthcare facilities, with rates of 5% in Europe and 5.7% to 19.1% in low- and middle-income countries. Vietnam faces similar issues, with HAI rates ranging from 3.5% to 10% of hospital admissions. Numerous studies have shown that adherence to hand hygiene practices is essential to reducing HAIs. This study aims to 1) Describe the current adherence to regular hand hygiene compliance and 2) Describe the factors influencing adherence of regular hand hygiene compliance among health staff in hospitals worldwide.

Methods: We conducted a narrative review on hand hygiene compliance. The review included original studies in English, published within the last 10 years, assessing hand hygiene compliance using an assessment tool, and analyzing related factors.

Results: Out of 988 retrieved publications, 899 articles were excluded due to duplication or insufficient criteria. After abstract screening, 80 full-text studies were reviewed. Findings indicated generally low hand hygiene compliance, particularly in low-income countries. High-income countries had higher hand hygiene compliance rates and knowledge levels among health staff. Significant differences in compliance rates were observed before and after patient contact. The main factors influencing compliance rates were knowledge, awareness, job position, and years of experience of health staff.

Conclusions: Comprehensive training and educational programs on hand hygiene, regular monitoring, and constructive feedback are essential to improve compliance among healthcare staff and reduce HAIs, particularly in low-income regions.

Keywords: Compliance, healthcare worker, medical staff, hand hygiene, hospital.

INTRODUCTION

Hand hygiene (HH) is the most effective measure to prevent hospital-acquired infections and ensure healthcare worker (HCW) safety. It involves cleaning hands with soap and water or using an alcohol-based solution. HH is a key component of standard precautions and essential for infection control in healthcare settings (1). Routine hand hygiene (RHH) requires washing

hands with soap and water or using an alcohol-based sanitizer for at least 30 seconds, following a six-step process (2). HCWs must adhere to the World Health Organization's five moments of hand hygiene: before any clean/aseptic procedure, after contact with blood or body fluids, after patient contact, and after touching patient surroundings (3).

Hand hygiene for medical staff is crucial as their hands act as conduits between patients



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and the external environment, risking microbial contamination from surfaces, equipment, or patient contact. Contaminated hands are a significant source of hospital-acquired infections, a rising challenge in medical facilities, leading to higher disease rates, antibiotic use, extended hospital stays, increased treatment costs, and mortality (4, 5). The WHO reports hospital-acquired infection rates of about 5% in European countries and 5.7%-19.1% in low- and middle-income countries (6). Vietnam faces similar challenges, with infection rates ranging from 3.5% to 10% (7). Studies indicate that improved hand hygiene compliance, especially in areas with invasive procedures like emergency medicine, intensive care, surgery, and pediatrics, can reduce hospital infections by 30%-50% (3). Thus, enhancing hand hygiene practices is vital for effective infection control in medical facilities.

Numerous studies indicate that routine hand hygiene compliance by medical staff is crucial for reducing hospital-acquired infections (8). A study at Debre Berhan Hospital, Ethiopia, using the WHO hand hygiene observation method, found an overall hand hygiene compliance rate of 22.0% among healthcare workers. Compliance was notably lower before patient contact (2.4%), before sterile procedures (3.6%), and after exposure to the patient's surroundings (3.3%) (9). Another observational study at an oncology hospital reported hand hygiene compliance rates of 41.7% before procedures and 72.1% after procedures, with an overall compliance of 34.3%. The study also showed higher adherence to hand hygiene in high-risk procedures (OR = 1.77, 95%CI, 1.18 – 2.65) (10). Additionally, a multicenter survey of hand hygiene practices in hemodialysis units revealed that healthcare workers washed their hands 35.6% of the time after patient contact and only 13.8% before contact (11).

Hand hygiene compliance became even more critical during the COVID-19 outbreak. A study

at the Hospital Universitario Insular de Gran Canaria showed an increase in compliance from 42.5% in 2018 to 47.6% in 2019 and 59.2% in 2020 ($p < 0.05$). Compliance was higher post-contact (67%) compared to pre-contact (48%). Physicians and nurses had higher adherence rates (73% and 74%, respectively) compared to nursing assistants (50%) ($p < 0.05$) (12).

The previous studies revealed variations in hand hygiene compliance. Therefore, this study aims to conduct a descriptive overview with the aims ii) to describe the current status of routine hand hygiene compliance among medical staff healthcare workers in hospitals worldwide, and ii) to identify factors affecting routine hand hygiene compliance/practice among healthcare workers in hospitals worldwide.

METHOD

Study Subjects: Criteria for selecting the article: (1) original research; (2) English or Vietnamese language; (3) the research subjects were medical staff; (4) using the checklist to assess hand hygiene compliance. We excluded all studies were conducted in special contexts such as COVID-19. Two investigators independently screened the studies to evaluate eligibility of the article with the criteria.

Study site and time: We reviewed studies conducted in all countries around the world from January 2023 to August 2023.

Sample size and sampling method: This study was conducted as a narrative review with reference to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses - PRISMA guideline (13).

We conducted a search strategy by combining teams about 1) hand hygiene, 2) medical staff, 3) hospital (table 1). The terms were combined using Boolean operators (AND, OR and NOT) which was performed on Medline, Pubmed, Web of Science, and Google Scholar from 2013 -2023.

Table 1. Search terms

Component	Search terms
Hand hygiene	Hand hygiene, hand sanitizer
Medical staff	Health staffs, healthcare worker, medical doctor, nurse, physician
Hospital	Hospital, health facility

Data analysis: A data extraction form was developed and used for the selected studies. Any disagreements during the screening and extraction process were resolved through discussion. The extracted data included year, country, study design, sample size, main influencing factors (e.g., gender, specialty, department) and their measurement methods, key outcomes (e.g., hand hygiene compliance) and their measurement methods (e.g., observation with a checklist, self-assessment). The study also identified factors affecting health workers' hygiene.

Ethical approval: This review utilized data from internationally published research

articles available for secondary analysis, so ethical approval was not required.

RESULTS

A total of 988 publications were reviewed. However, 899 articles were excluded due to duplication or failure to meet the selection criteria including original study, English or Vietnamese language, health care workers as research subjects, use of checklists to assess hand hygiene compliance, study locations in countries around the world, publication time within the last 10 years, and analysis of factors related to or influencing hand hygiene compliance of health care workers (Figure 1). After screening the abstracts, 9 articles were excluded. The final result was that 80 studies were reviewed in full text. Studies not included in the analysis included those implemented in special contexts such as the COVID-19 pandemic and those that included interventions or involved hand hygiene training.

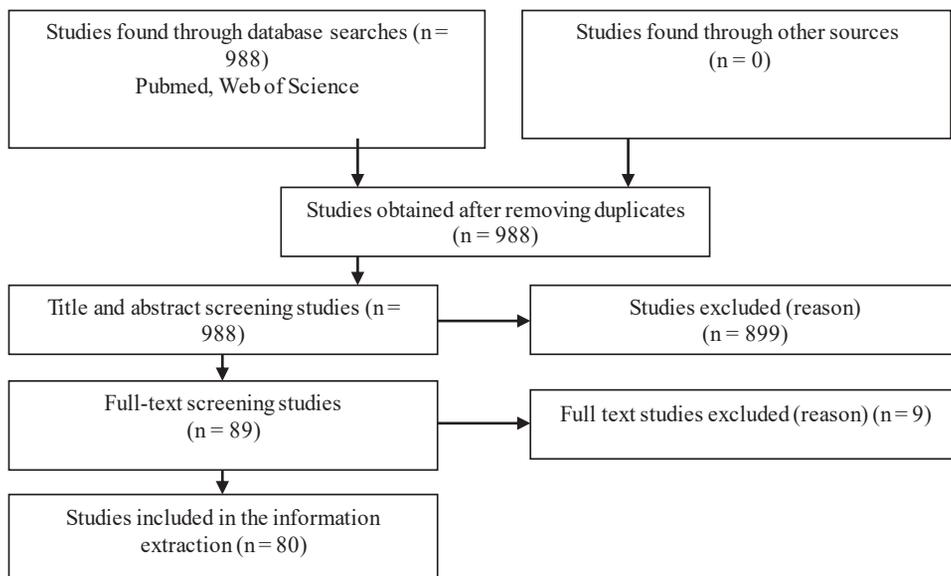


Figure 1. PRISMA flow chart

Study characteristics

All reviewed studies were restricted in PubMed in English language. Among 80 studies, the most frequent study were observation (26 studies), cross-sectional (28 studies), intervention (7 studies), quantitative (7 studies) and other (12 studies). Studies were conducted in various countries, which include 25 Asia countries, 20 European countries, 24 African countries, 7 American Latin, and other areas. Regarding income, the studies were carried out in 10 low-income, 22 low-middle-income, 11 upper-income, and 34 high income countries, 3 multi-countries.

Hand hygiene compliance rate by countries.

Overall, hand hygiene compliance rates tend to improve from low-income to high-income countries, indicating a correlation between national income levels and adherence to hand hygiene practices.

Among high-income countries, the hand hygiene compliance rate was quite high. The highest rate of HHC was in Austria (88.6%) (14), followed by Saudi Arabia (87%) (15), Finland (84.9) (16), Germany (69%) (17), Poland (64.7%) (18). However, Switzerland shows a notably low compliance rate of only 4.7% (19). Among middle-income countries, Guinea has the lowest compliance rate at 23.7% (20), while Malaysia reports a rate of 87.6% (21), and Indonesia has the rate at 83.6% (22). In lower-middle-income countries, India showed a range of compliance rates from 31.8% to 67.7% (23-25). Egypt saw an increase from 30.9% to 69.5% post-intervention (26). In Ghana, compliance improved from 67% to 92% following educational program (27). In low-income countries generally report lower compliance rates. Ethiopia has the lowest at 20.6%, with variations from 22.2% to 18.7% over the years, whereas Sierra Leone has a higher rate of 48.6% (28-30).

Hand hygiene compliance rates among different healthcare worker groups

Hand hygiene compliance rates among doctors and nurses vary significantly worldwide. Among doctors, Ireland, Bangladesh and Saudi Arabia have the highest compliance rates, ranging from 78% to 100% (15, 31, 32), while Iran, Malawi, and Bangladesh have rates below 10% (31, 33). For nurses, Austria, Saudi Arabia, India, and Vietnam have the highest compliance rates, ranging from 78.3% to 97.8% (14, 15, 34) whereas Nigeria, Guinea, and Switzerland have rates below 10% (19, 20, 35, 36).

Overall, nurses generally have higher compliance rates compared to doctors, except in Poland and India. Both groups need to improve hand hygiene compliance, especially in countries like Malawi, Nigeria, and Bangladesh, to reduce infection risks and protect the health of patients and healthcare workers.

Hand hygiene compliance rate across regions

Hand hygiene compliance rates vary significantly across different regions. In Asia, Indonesia has the highest compliance at 83.6% (22), while Kuwait and Hong Kong are lower at 25% and 15%, respectively (37, 38). In Europe, Germany, Poland, and Austria have high compliance rates from 64.7% to 88.6% (14, 17, 18). Conversely, Switzerland and the Netherlands have lower rates at 4.7% and 17% (19, 39). Finland recorded the highest rate between 2013 and 2018, at 84.9% (16). In the Americas, Ecuador has the lowest compliance at 11.6% (40), while the United States has an average of 47.6% with many hospitals below 50% (41). U.S compliance rates for entering and existing clinics are 49.8% and 63.9%, respectively (42).

In Africa, Ethiopia, Nigeria, and Tanzania have low compliance rates ranging from 18.7% to 34.7% (28-30, 35, 36, 43). Ghana showed significant improvement, from 67% to 92% (27).

Overall, hand hygiene compliance rates vary markedly across regions, with some countries achieving high rates while others are lower.

Factors affecting routine hand hygiene compliance/practice among healthcare workers in hospitals around the world

The study applied the ecological model theoretical framework to analyze factors affecting around the world. The factors include three main groups: personal, environmental, and social factors. The theoretical framework of the social-ecological model is shown as shown below:

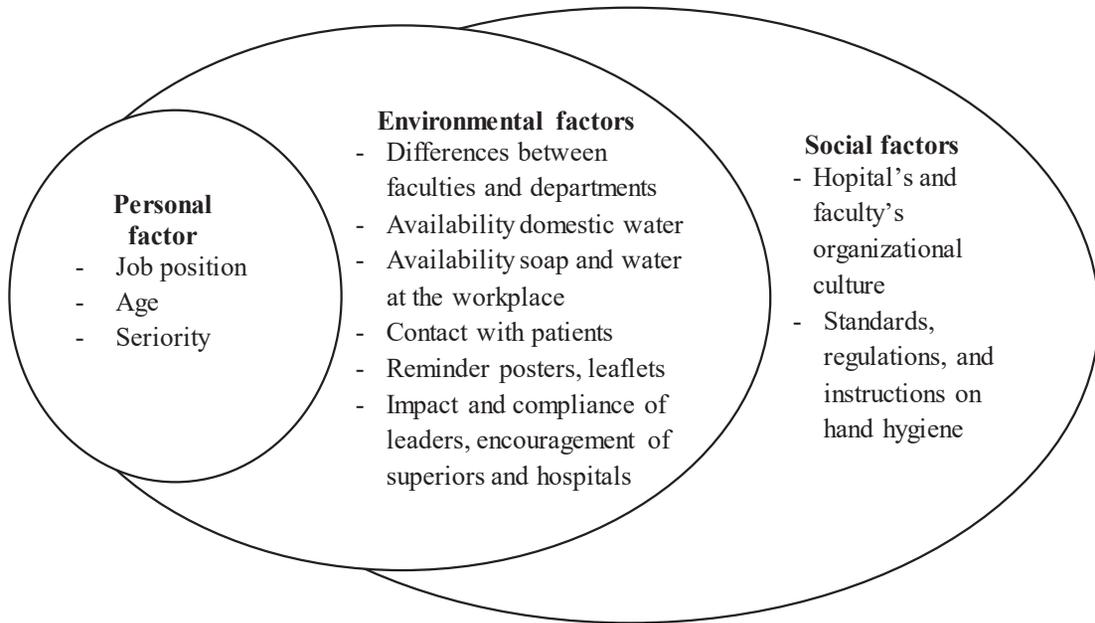


Figure 2: Framework of social-ecological model for impact factors

Personal factors:

Results from 80 studies indicate that healthcare workers' job positions affect hand hygiene compliance. Nurses and nurse assistants, doctors, medical students, and technicians are the largest participating groups. Among the 80 studies, 38 mention nurses, 28 involve doctors, 7 discuss students, and 27 refer to healthcare workers in general. The results show varying compliance among different professionals. In the study by Le CD et al., doctors had the lowest compliance rate (67.2%), while nurses had the highest (97.8%) (34). The study by Bredin D et al. showed a weighted overall compliance rate of 52% for nurses and 45% for doctors (44). Hilt N et al.'s research indicated that nurses had a lower compliance rate (16%)

compared to general practitioners (34%) (45). Practice assistants had the highest rate (51%). Studies also revealed variations in compliance based on age and seniority, with nurses having over 10 years of experience showing better compliance (46, 47).

Environmental factors

Environmental factors, such as differences between departments, affect hand hygiene compliance. Compliance rates vary before and after patient contact, and before and after entering procedure rooms. Amaan A's study in Bangladesh reported compliance rates before and after patient contact of 42.9% and 28.5%, respectively (31). Umar H's study found low compliance across departments,

highest in internal medicine (46.8%) and lowest in obstetrics (20.7%) (47). Nurses in departments with accessible water complied 2.19 times more than those had not accessible. Engdaw GT's study indicated that healthcare workers with adequate soap and water were 3.77 times more likely to comply (48).

Healthcare workers who frequently interact with patients (26, 30, 38, 49-52) and those caring for highly infectious patients (16, 41) are more likely to adhere to hand hygiene practices. Surgical department staff are more diligent in hand disinfection compared to those in general departments like emergency, due to frequent contact with blood and body fluids. On the other hand, emergency department healthcare workers rarely disinfect their hands properly due to the nature of their work, patient emergencies, and time constraints (20, 49, 53-55). Posters and hand hygiene guidelines in hospitals contribute to higher compliance rates (29, 31, 56). Compliance is further improved by leadership influence, encouragement from superiors, organizational support, and the older age of healthcare workers.

Social factors

Organizational culture, hand hygiene standards, and other social factors impact healthcare workers' hand hygiene compliance (57). Studies indicate that lack of motivation and organizational norms are major barriers (23). Nurses often encourage and support each other more in hand hygiene compliance than doctors (53).

Predictors of non-compliance include high workload, time constraints, higher patient-to-nurse ratios (17, 23, 30, 33, 34, 37, 42, 51, 58-63), and forgetting to perform hand hygiene (23, 33-35, 39, 54, 59, 62, 63). The overuse of medical gloves also reduces hand hygiene performance (33, 51, 63). A lack of equipment and supplies such as handwash,

alcohol-based hand sanitizers, sinks, soap, or paper towels, and intolerance to hand hygiene products are key barriers (17, 23, 25, 28, 34, 35, 39, 55, 58, 60, 64-66).

Other barriers include risk factors like artificial nails, rings, bracelets, long sleeves (18), and silence in the face of non-compliance (67). Additionally, the impact of professional roles (35, 54, 68), gender, and work hours on hand hygiene compliance remains unclear.

DISCUSSION

Numerous studies conducted in both the Americas and Africa have significantly contributed to the understanding of the efficacy of routine hand hygiene practices and the developing strategies for their enhancement. These studies have elevated awareness regarding the critical role of hand hygiene in mitigating the transmission of healthcare-associated infections and have improved routine hand hygiene compliance rates among hospital medical staff.

The review also revealed differences in routine hand hygiene compliance rates between physicians and nurses. Meta-analyses of all studies, regardless of bias risk, seem to indicate that nurse compliance is significantly higher than that of physicians, with overall average rates ranging from 16-97.8% and 6-86.39%, respectively. This finding is similar to Bredin D et al., who observed a weighted overall compliance rate of 52% (95% CI: 47-57) for nurses and 45% (95% CI: 40-49) for physicians (44). Similarly, the study by Madden C et al., conducted in four intensive care units (ICUs) across three hospitals in Ireland, showed nurse compliance rates of 61.1% compared to physician compliance rates of 48.6% (69). Both physicians and nurses undergo extensive training in hand hygiene and infection prevention protocols, providing them with the knowledge, practical skills, and awareness of

the importance of hand hygiene in preventing infections in healthcare settings. Nurses are often directly involved in daily patient care and have frequent direct contact with patients, which may heighten their awareness of the importance of routine hand hygiene, leading to greater vigilance and better adherence to hand hygiene procedures. However, these studies face limitations due to inconsistent definitions of physicians and nurses.

In poorly performing facilities, managers were less likely to visit departments and more likely to consider hand hygiene outside their scope of influence. If healthcare staff do not fully comprehend the impact of bacteria and infection or fail to recognize that they can transmit diseases to colleagues, they may not prioritize proper hand hygiene. Additionally, leadership oversight significantly affects hand hygiene practices among hospital staff. When leaders consistently emphasize the importance of hand hygiene, provide necessary resources, and hold individuals accountable, it fosters a culture of compliance throughout the organization.

The disparity in hand hygiene compliance rates between low-income and high-income countries highlights that infrastructure is a crucial factor influencing routine hand hygiene adherence. The average compliance rates in high-, middle-, and low-income countries range from 4.7-88.5%, 21.1-96.3%, and 19-37.4%, respectively, indicating significant limitations in routine hand hygiene compliance in low-income countries. These countries often face resource and healthcare infrastructure constraints. The lack of resources such as clean water, soap, or antiseptic solutions can impede performing routine hand hygiene. Conversely, even with good infrastructure and supplies in high-income countries, improper placement and arrangement of handwashing facilities can still impact compliance rates.

Although previous reviews have studied routine hand hygiene practices in healthcare facilities and hospitals, few have specifically addressed the differences in compliance. This study focuses on healthcare workers in various hospitals worldwide, particularly discussing factors affecting their hand hygiene compliance rates. However, the review is limited by evidence, as only studies published in English were selected. Most studies were conducted using observational or self-assessment methods, which are prone to bias. Additionally, significant heterogeneity and lack of outcome data in some studies could affect the overall accuracy of the results. Therefore, this research is intended to inform policies and intervention programs aimed at reducing hospital-acquired infections.

CONCLUSION

This review aims to describe routine hand hygiene compliance differences among healthcare workers and identify influencing factors. Results indicate that in direct observational studies, nurses show higher compliance than physicians. Key factors affecting hand hygiene compliance include knowledge, education, and attitude. Additionally, workplace environment factors such as lack of infrastructure, basic equipment, resources, experienced staff, work location, and working hours significantly impact compliance. Social factors like training and educational interventions also hinder to proper hand hygiene practices among healthcare workers.

Comprehensive training and educational programs on hand hygiene for healthcare workers are necessary to address these issues, particularly in low-income regions like Africa. These programs should cover the importance of proper handwashing techniques, selection of hand hygiene tools, and the role of hand

hygiene in preventing healthcare-associated infections. Training should be thorough and interactive, include practical components, and regularly update.

Moreover, regular monitoring of hand hygiene compliance and providing constructive feedback are essential. Utilizing indicators and criteria to assess compliance levels and identify areas for improvement is crucial. This data is important for evaluating the effectiveness of interventions and ensuring the continuity and sustainability of hand hygiene improvement efforts. By implementing these measures, healthcare facilities can enhance healthcare workers' knowledge and awareness of proper hand hygiene responsibilities, reducing infection risk and improving healthcare quality.

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