

## Conference Paper

# The Importance of Implementation of Hand Hygiene Practice in Reducing Healthcare-associated Infections: A Systematic Review

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## Abstract

Healthcare-associated Infections (HAIs) become the priority attentions of health authorities worldwide because it became the most frequent adverse event of infections in the health care system. Hand hygiene is the effective way in preventing HAIs since healthcare personnel's hands frequently serve as vectors in transmission of organism from personnel's hands to patient's, and for that reason, hand hygiene become important to patient safety. Although it is seen as the most important way to reduce HAIs' rate, hand hygiene compliance among healthcare professionals continues to be low, and most efforts to improve it have failed. This study aims to assess the hand-hygiene practices in health workers in order to reduce HAIs. The study is a systemic review with PRISMA method, articles were downloaded from online databases such as ProQuest and SAGE using keywords hand hygiene, hand washing, and Healthcare-associated Infections. The period of the articles that had been review is 10 years backwards. After the title was selected, the next step was to read the abstract and full article. Authors determined 11 articles in qualitative synthesis study to be reviewed. As a result, there were 11 journal articles, 10 of which were on observational studies and 1 was an experimental interventional study. Four of the articles were based on systematic review analysis and the rest of the articles were based on statistics analysis. Half of the studies in this systematic review were done in the American region, two studies in European regions and three studies in Asian regions that included Thailand, Saudi Arabia, Shanghai, and China. From all of the articles, only five showed a positive association between implementation of hand hygiene and HAIs. The positive articles gave information that the practice of hand hygiene significantly decreases HAIs' rate. This systematic review proved that hand hygiene is clearly effective to reduce HAIs' rate. Improvement of hand hygiene practice resulted in reduction of both gastrointestinal illness and respiratory illness. In practice, more women than men wash their hands and between health workers, nurses achieve higher compliance than physicians. Even when hand hygiene is proven to be the best way to reduce HAIs, the compliance of hand washing still lacks and needs more monitoring and strategies to improve.

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 OPEN ACCESS**Keywords:** hand hygiene, hand washing, Healthcare-associated Infections

## 1. Introduction

Healthcare-associated Infections (HAIs) become the priority attentions of health authorities worldwide since it became the most frequent adverse event of infections in health care system [1]. World Health Organizations defines HAIs referred to nosocomial or hospital infection as an infection occur in a patient during the process of care in a hospital or other healthcare facility which was not present or incubating at the time of admission [2]. Emori and Gaynes said that Healthcare Associated Infections (HAIs) is defined as one in which there is no evidence of patient infection (or colonization) at the time of admission to a hospital [3]. HAIs related to prolonged hospital stay, increased morbidity and mortality, extra financial burden, increase length of stay (LOS) and increased microbial resistance to anti microbe [1]. The future burden of endemic HAIs is congruent to the WHO Report in 2011. According to this report, seven out of 100 hospitalized patients in developed countries and ten out of 100 hospitalized patients in developing countries will develop at least one case of HAIs [2]. For treating some of these infections, healthcare teams make great effort to improve healthcare worker safe practices and reduce the spread of bacteria and viruses that lead to HAIs [4]. The major types of HAIs infections are bloodstream infections (BSI), surgical-site infections (SSI), pneumonia, urinary tract infections and catheter category [3]. The minor types of HAIs infection are respiratory and gastrointestinal illness. Respiratory symptoms of infection can be cold symptom and influenza. Gastrointestinal symptoms can be diarrhoea, vomiting or dysenteries [5].

Hand hygiene is regarded as the most effective means of preventing Healthcare Associated Infection [6]. Hand hygiene also important for patient safety because hands of health care personnel frequently serve as vectors for the transmission of organisms from personnel hands to patient and are also a major reservoir for pathogens with antimicrobial resistance. For this reason, In 2005, the WHO World Alliance for Patient Safety launched a campaign, the First Global Patient Safety Challenge—Clean Care is Safer Care—aiming to improve hand hygiene in healthcare [7]. However, despite the continuous efforts, healthcare professionals' compliance about hand hygiene guidance remains sub-optimal [8].

Although hand hygiene is seen as the most important method to prevent the transmission of HAIs, hand hygiene practice in reducing HAIs seems to remain poor and challenging. This study aims to assess the hand hygiene practices among health workers in order to reduce Healthcare Associated Infections. Thus, the practice of hand hygiene could be adopted by all healthcare workers to reduce the HAIs.

## 2. Methods

This is a systematic review based on PRISMA Protocol. The journal articles are searched on online databases such as ProQuest and SAGE using keywords: *hand hygiene, hand washing and Healthcare Associated Infections*. The downloading process was valued independently by the author. Based on just the keywords, from two online data base, 5788 articles are found. The articles are downloaded on November 2016. The author filter the selected articles using time restriction, choosing only articles published from 2006 until 2016 to make the review more updated, resulting in 390 articles. Next, the author made the exclusion criteria which are the type of source and subject. After using the abovementioned criteria, the number is reduced to 365 articles. Furthermore, author selected the title, read the abstract and full-text articles to determine 11 articles in qualitative studies. The selection process of the articles in this review presented in Figure 1.

## 3. Results

As a result, there are 11 journal articles, 10 of them are on observational studies and 1 study is experimental interventional study. Four of the articles based on systematic review analysis and the rest article based on statistics analysis. Half of the studies in this systematic review done in American region, 2 studies in Europe region and 3 studies in Asia region which are Thailand, Saudi Arabia and Shanghai, China.

From all of the articles, only 5 articles showed positive association between implementation of hand hygiene and HAIs. The articles showed that the implementation of hand hygiene decreases the Healthcare Associated Infections significantly [3–6, 9].

Another findings in this review showed that the rest of articles shows that knowledge of HAIs and compliance of hand hygiene take more effect on reducing rates of Healthcare Associated Infections. Reviews of each article can be seen in Table 1.

## 4. Discussion

### 4.1. Hand hygiene and HAIs

Hand hygiene is still the most powerful way to reduce the Healthcare Associated Infections rates [5, 6, 9, 10]. Implementing hand hygiene to prevent HAIs could be done with hand washing with water alone, with soap (anti-bacterial, non-anti-bacterial soap) or

TABLE 1: Summary of article journal.

No.	Article	Authors	Research Design	Variable	Analysis	Result
1.	Effect of Hand Hygiene on Infectious Disease Risk in the Community Setting: A Meta-Analysis	Allison E. Aiello Rebecca M. Coulborn Vanessa Perez Elaine L. Larson	Meta-Analysis	Independent Variable: Hand Hygiene Dependent Variable: Infectious Disease Rise	Meta-analysis Forest for mixed modelling procedure. To assess statistical heterogeneity with the Cochran Q-statistic and the I2 statistic	Positive: Improvements in hand hygiene resulted in reductions in gastrointestinal and reductions in respiratory illness The most beneficial intervention was hand-hygiene education with use of non-antibacterial soap. Negative: Heterogeneity of study characteristic and design Publication Bias
2	Types of interventions used to improve hand hygiene compliance and prevent healthcare associated infection	Dinah Gould Nicholas Drey	Observational	Independent Variable: Type of interventions Dependent Variable: Healthcare Associated Infections	Systematic Review	Positive: Hand Hygiene prove to be the best way to reduce HAI Negative: There is no lack of compliance of Hand Hygiene and need more interventions to improve the compliance
3	A Simulation Model to Compare Strategies for the Reduction of HealthCare Associated Infections	Reidar Hagtvedt Paul Griffin Pinar Keskinocak	Observational	Variable Dependent: Reduction of HAIs Variable Independent: Strategies Model associated with HAIs	Literature Review	Positive: Hand Hygiene have strong impact on HAIs rates Negative: Hand Hygiene cannot work alone but need another strategies like isolation policies
4	Student and infection prevention and control nurses' hand hygiene decision making in simulated clinical scenarios: a qualitative research study of hand washing, gel and glove use choices	Karen Lee	Observational Computer based Survey	Independent variable: Infection prevention method choices Dependent Variable: Reducing infection	Thematic Analysis	Positive: Using soap and water is more likely in the workers besides using alcohol hand gel. Negative: Social desirability bias There is no data about how soap and water reduce the infection rates

No.	Article	Authors	Research Design	Variable	Analysis	Result
5	Comparative efficacy of interventions to promote hand hygiene in hospital: systematic review and network meta-analysis	Nantasit Luangasanatip, Maliwan Hongsuwan Direk Limmathurotul	Observational	Independent variable: Interventions of hand hygiene Dependent variable: Comparative efficacy of hand hygiene	Systemic Review Semi Meta-Analysis	Positive: WHO-5 positive to increase hand hygiene compliance in healthcare workers Negative: There is no data about the infection rates
6	Intensive care physicians' and nurses' perception that hand hygiene prevents pathogen transmission: Belief strength and associations with other cognitive factors	Yoel Lubell, Andie S Lee, Stephan Harbarth, Nicholas P J Day, Nicholas Graves, Ben S Cooper	Observational Retrospective case control study	Dependent variable: Hand hygiene perceptions Independent variable: factors association with hand hygiene perceptions	Linear regression for evaluate each variable	Positive: Physician and nurse believe that pathogen transmission higher when they not disinfected their hands Negative: There is no data about the HAI rates
7	A review of Electronic Hand Monitoring: considerations for Hospital Management in Data Collection, Healthcare worker supervision, and Patient Perceptions	Maryanne Mcguckin	Observational	Dependent variable: HAIs reduction Independent variable: Hand hygiene monitoring	Literature review	Positive: The use of electronic Hand monitoring reduce the HAIs The use of Hand monitoring increase Hand Hygiene compliance Negative: Hand monitoring system not cost effectively
8	Effect of Guideline Implementation on Costs of Hand Hygiene	Patricia W. Stone, Sumya Hasan, Dave Quiros, Elaine L. Larson	Observational Descriptive study	Dependent variable: Effect of Guideline Independent variable: Guideline of Implementation Hand Hygiene	Chi-square analysis for measure association between compliance of Hand Hygiene and alcohol use	Positive: Sample data is reliable and valid Negative: There is no direct association between Hand Hygiene tools with cost No data about Hand hygiene tools with reduction of HAIs

No.	Article	Authors	Research Design	Variable	Analysis	Result
9	Healthcare-associated Infections and Shanghai Clinicians: A Multicenter Cross-sectional Study	Yunfang Zhou Dangui Zhang Youting Chen Sha Zhou Shuhua Pan Yuanchun Huang William Ba-	Observational Cross Sectional Study	Dependent variable: Healthcare Associated Infections Independent variable: Clinician knowledge and attitude	Multiple linear regression	Negative: HAIs incidence in 13 hospitals was reported 4% and that indicated that HAIs awareness still low
10	Impact of a hospital-wide hand hygiene initiative on healthcare-associated infections: results of an interrupted time series	Kathryn B Kirkland Karen A Homa Rosalind A Lasky Judy A Ptak Eileen A Taylor Mark E Splaine	Experimental study	Dependent variable: Healthcare Associated Infections Independent variable: Hospital wide hand hygiene initiative	Chi square analysis to compare specific rates Pairwise comparison to measure correlation between HH compliance and HAIs rates	Positive: HH compliance increased significantly from 41% to 87% Nurses achieved higher HH compliance (93%) than physicians (78%). There was a significant, sustained decline in the healthcare-associated infection rate from 4.8 to 3.3 ( $p < 0.01$ ) per 1000 inpatient days. Negative: Long-time study research (3years) High cost study
11	Assessing Healthcare Associated Infections and Hand Hygiene Perceptions amongst Healthcare Professionals	Tan, Amil Kusain Jr Olivo, Jeffrey	Observational Descriptive survey	Dependent variable: HAIs independent variable: Hand Hygiene perceptions	Descriptive statistic and inferential non-parametric	Positive: 99% respondent knew that hand hygiene is single way to reduce HAIs Negative: There is no specific rates about the Hand Hygiene reduce HAIs

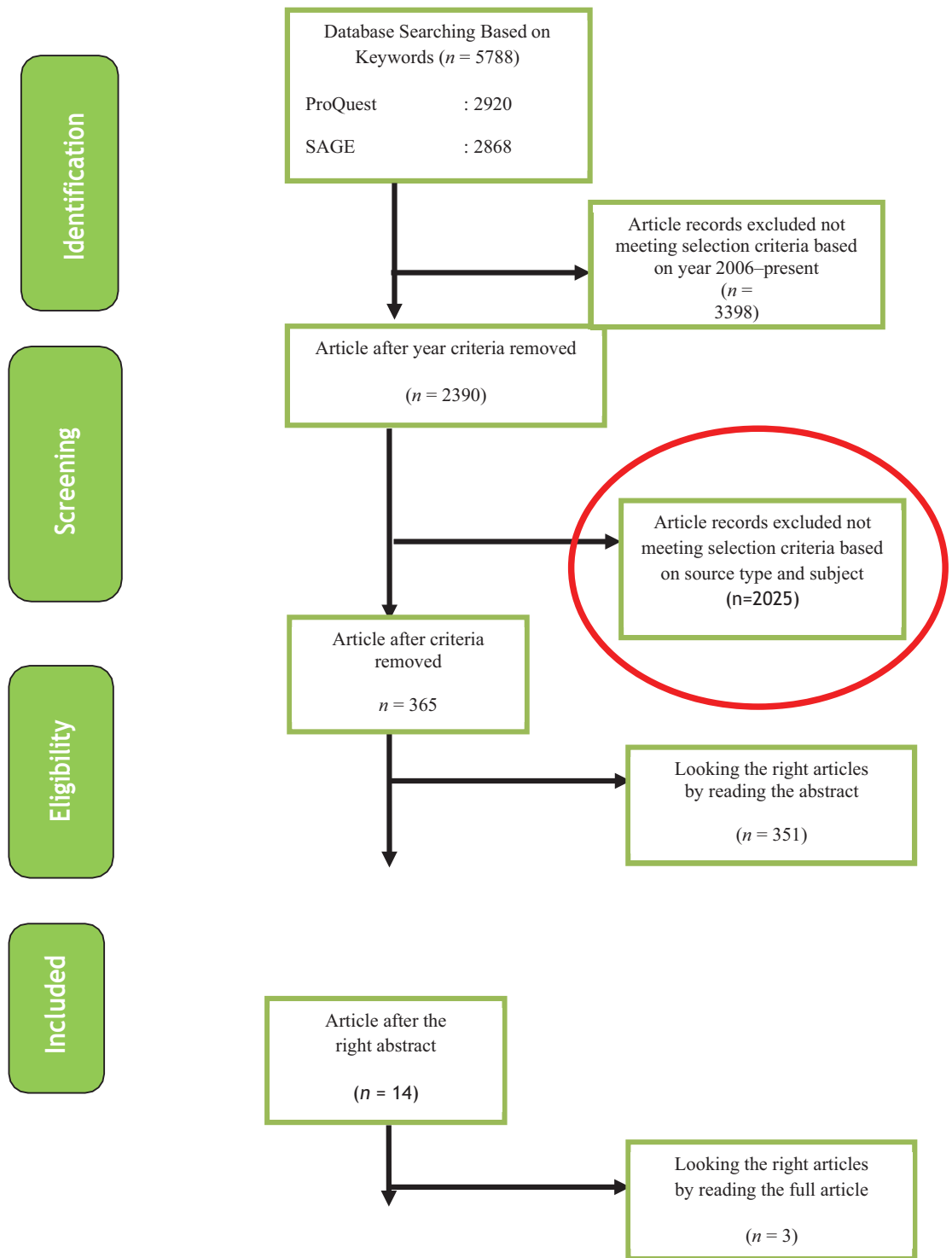


Figure 1: Flow chart of study selection.

with waterless hand sanitizer (alcohol based hand sanitizer, non-alcohol based hand sanitizer) [5]. Either hand washing just with water or soap, alcohol based rub or with towel have the same potential to reduce HAIs rates, the greater result shown in hand

washing with water and soap. Improved hand hygiene resulted in reduction both gastrointestinal and respiratory illness, it is found that gastrointestinal illness reduced until 31% (95% CI = 19–42%) and respiratory illness reduced until 21% (95% CI = 5–34%) [5]. The use of non-antibacterial soap in hand washing shows the strongest protective effect on both gastrointestinal and respiratory illness [5]. The use of anti-bacterial soap just added little benefit compared with the non-anti-bacterial. But in contrast, the use of anti-bacterial soap has shown some efficacy in both illness when compared with non-intervention group [5].

Differences in the frequency and timing of hand hygiene practice may account for the stronger reductions rates of the gastrointestinal illnesses than the respiratory illnesses. This difference probably happens because hand hygiene practices directly after coughing or sneezing may not be as consistent or as frequent as hand hygiene practices directly after defecation [5].

#### 4.2. Hand hygiene and its compliance

Hand hygiene compliance still remains challenging despite the numerous guidelines has been published. Factors from the health workers such as skin-irritating soap, hard soap, lack of awareness of the importance of hand hygiene, forgetfulness and heavy workload has been attributed to health workers lack of compliance reason. Studies show that health workers only wash their hands only when it necessary, not always when hands are more likely to be heavily contaminated and the technique is still remain poor [6]. Another factor is the hand sanitizer accessibility. Increased accessibility of alcohol-based hand rubs has been associated with significantly higher rates of hand hygiene practice [10]. Major advantages of alcohol-based hand rubbing are that less time is required for hand washing compared to traditional hand washing with soap, and hand hygiene product dispensers can be distributed widely throughout the health care environment without the need for sinks and paper towel or hand-drying equipment [11]. Other approaches method like dispensing an existing product, individual dispensers carried by health workers and placing dispensers in more prominent positions can be added as a way to improve the hand washing practice [6].

Majority of the health care professional had a very high degree of awareness about the effectiveness of hand hygiene against Healthcare Associated Infection [2]. But in hand washing practices, more women (75%) than men (58%) washed their hands, suggesting gender difference [5] and between the health workers, nurse achieved



higher compliance than physician which nurses achieved higher hand hygiene compliance (93%) than physicians (78%) [9]. Another study showed that nurses were generally better than physicians particularly in hand hygiene, perhaps because nursing job is more patient oriented and compliance demanding meanwhile physician considered play important roles as opinion leaders, decision makers, and role models in clinical environment [1].

### 4.3. Hand hygiene intervention and monitoring

The need of hand hygiene intervention are important to improve the compliance of hand hygiene practice especially for physicians [9]. A series of interventions began in late 2006, and by 2008, explicit interventions were implemented across the medical centre and no new interventions were added since then [9]. Organizational factors such as staff engagement, commitment of the department heads, and leadership were perceived to be significant in promoting hand hygiene practices [2]. Reward incentives from organizational leader both financial and non-financial for the workers who complete the level of compliance can be added to improve the compliance of hand hygiene [9]. An electronic learning module and a training video that provided hand hygiene education for all staff which accessible through the hospital intranet can also be implemented [9]. Making a series of awareness-raising posters and screen savers, writing stories in medical centre publications and local news outlets, and using direct communications with staff about expectations and progress towards goals can be done as an effort to improve quality of hand hygiene practice by marketing staffs [9].

Monitoring hand hygiene practices and providing feedback appear to be important components of more successful hand hygiene programs. Methods to monitor hand hygiene include direct observation by anonymous observers, self-reporting, measuring or monitoring product usage, and non-direct observation by electronic monitoring system [11]. Routine hand hygiene audits on all units, and continued surveillance for Healthcare Associated Infections which were published on an intranet site available to all staff, and reported to executive leadership, clinical leaders and board members can be a direct methods to measure and monitor the compliance of health workers [9]. Electronic monitoring in hand hygiene compliance show promising result with automatic data gathering, data analysis and real-time feedback reporting [4].

## 5. Conclusion

This systematic review shows that implementation hand hygiene practice is needed for reducing HAIs. Hand hygiene is proven to reduce gastrointestinal illness and respiratory illness better than other HAIS infection. This review also suggest more research is needed to be conducted to measure the effect of hand hygiene and HAIs rates not only for gastrointestinal illness and respiratory illness but also for other HAIs like Ventilator Related Pneumonia (VAP), Urinary Tract Infection related catheter, central line associated bloodstream infection and least is Methicillin Resistant Staphylococcus Aureus (MRSA) infection.

Even though the awareness of Healthcare Associated Infections among healthcare workers is good, the compliance of hand hygiene practice is still lacking and needed to be enhanced. Monitoring of compliance, direct or non-direct observation, and support from management are strongly recommended to improve it.

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