

IMPROVING HAND HYGIENE COMPLIANCE THROUGH WHO'S MULTIMODAL HAND HYGIENE IMPROVEMENT STRATEGY

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Abstract

Introduction: Hand hygiene compliance of Health Care Workers (HCW) in Indonesia for the year 2014 was only 73.34%, a rate that was much lower than WHO's recommended standard. This is indication that there is a need to implement quality improvement. In 2015, the WHO's multimodal hand hygiene improvement strategy was implemented in all units or wards of hospitals as a measure to improve Hand Hygiene among healthcare workers. This paper aims to demonstrate the improvement of hand hygiene compliance amongst HCWs in hospitals by using the WHO multimodal hand hygiene improvement strategy.

Materials and Methods: This study is cross sectional involving observations performed of different HCWs in the hospital site. Quantitative in design, this study is supported by the chi-square analysis which helps to determine the significance of hand hygiene compliance improvement among healthcare workers in Indonesian hospitals. The WHO's multimodal improvement strategy which comprised system change initiatives, training and education, evaluation and feedback, reminders in the workplace, and institutional safety climate was applied.

Results: The hand hygiene compliance was collected through observations in one private hospital at West of Indonesia by using the hand hygiene audit form. The monthly hand hygiene audit compliance was conducted from 2014 involving a total number of 2233 observations comprising 31267 opportunities of hand hygiene compliance. In 2017, a total of 4466 observations were recorded, involving 6246 opportunities of hand hygiene compliance. The hand hygiene compliance varied between, 78% to 92% for each unit or wards being observed. The highest compliance was noted in the critical care ward. In terms of profession, the highest compliance was observed by the health care assistants (HCA). Hand hygiene compliance was found to increase significantly, from 73.34% in 2014 to 91.8% in 2017 ($p < 0.0001$).

Conclusion: Implementation of the WHO's multimodal hand hygiene improvement strategy had increased the hand hygiene compliance of healthcare workers in the Surabaya hospital significantly.

Keywords: Hand Hygiene Compliance, WHO Multimodal Hand Hygiene strategy

Introduction

Hand hygiene is considered the most important measure which can reduce the transmission of nosocomial pathogens in healthcare settings. A recent review by Larson (1) reported on seven quasi-experimental hospital-based studies which looked at the impact of hand hygiene on the risk of nosocomial infection, between 1955 to 1977 (2,8). Larson concluded that there was a temporal relation between improved hand-hygiene practices and reduced infection rates. Hand hygiene, either by handwashing or hand disinfection, remains the single most important measure for preventing nosocomial infection (9). The importance of this simple procedure is, however, not adequately recognized by health-care workers, (10) and this is evidenced in the poor compliance repeatedly documented (11, 12).

According to the World Health Organization (WHO), adverse events in healthcare are a global concern, and healthcare-associated infections (HAIs) are the most predominant of such events (13). A healthcare associated infection is an infection which a patient acquires during hospitalization, and which increases the risk of morbidity, mortality, and prolonged hospital stay (14, 15). At any given time, the prevalence of health care-associated infections in developed countries varied between 3.5% to 12% (16). The prevalence of HAIs is strongly associated with the type of medical service provided, and the behavior of healthcare workers (HCWs) (17). This includes the hand hygiene behavior of the healthcare workers. Contaminated hands on HCWs have been identified as the cause of several outbreaks. An effective and recommended solution for preventing the transmission of micro-organisms is to improve hand hygiene compliance in healthcare organizations.

Hand hygiene compliance in the Surabaya hospital in 2014 was rated at 73.34%, a rate that was lower than the WHO standard of 85%. In 2015, the WHO's multimodal hand hygiene program was implemented in all departments (units and wards) in the hospital. The Surabaya

hospital has a bed capacity of 160, comprising 154-bedded wards, and a 6-bedded ICU, with 314 HCWs. At the baseline evaluation, alcohol-based hand rub dispensers were already widely distributed at the hospital. These were evidently located in the inpatient and treatment rooms, corridors as well as on trolleys and equipment. Thus, access to alcohol-based hand rub was recognized by the Infection Control Nurse. This study aims to improve hand hygiene compliance in HCWs in Surabaya hospitals by using the WHO's multimodal hand hygiene improvement strategy as an implementation tool.

Methods**Study design**

This study is a cross sectional study which employed a quantitative approach to collect and analyze data of the Surabaya hospital in Indonesia. The WHO's multimodal hand hygiene compliance strategy was implemented in the wards where HCWs would have physical contact with patients. The hand hygiene compliance of these HCWs was observed for a total of 4466 observations involving 14 wards and the observations generated a total of 6246 opportunities of hand hygiene compliance.

Data Collection

Data were collected using hand hygiene compliance World Health Organization's hand hygiene audit form, hereby also noted as observations. The duration of the observations lasted from 2015 to 2017 to compare hand hygiene compliance during two different periods before and after WHO's multimodal hand hygiene strategy. The dependent variable involved in the current study was the hand hygiene compliance. Data analysis was then performed by dividing the number of correct hand hygiene opportunities with the total number of hand hygiene opportunities. The independent variables being examined in this study include the type of healthcare workers (i.e., physicians, nurses, or others). In this context, hand hygiene compliance was coded as "missed" if there was no hand hygiene action performed; as "rub" if there was hand hygiene action by hand rubbing with an alcohol-

based formulation or “washed” if there was hand hygiene action by handwashing with soap and water.

During observations, a few interventions were performed and they were structured according to the five elements of the WHO’s multimodal improvement strategy (18) - system change initiatives, training and education, evaluation and feedback, reminders in the workplace, and institutional safety climate. These interventions were conducted in all the 14 wards including the inpatient and outpatient wards, the operating theatre, and the critical wards. The measurement was then expressed as a ratio with the numerator being the number of handwashing or disinfection instances actually carried out by the healthcare workers. The denominator was the number of opportunities for hand hygiene, as defined by WHO’s 5 moments for hand hygiene frameworks (18). The ratio was then expressed as a percentage. Observers of the hand hygiene compliance in this study were trained by the Infection Control Nurse and the observers’ training was designed using the WHO concept, as described in its technical reference manual (19). Observations were carried out using videos downloaded from the video and podcasts of WHO in <https://www.who.int>. A grid to assess the opportunities for hand hygiene was also adapted from the WHO’s model (20). The grid consists of a box that could be ticked to capture whether the indication to hand hygiene had been complied with or not, for each opportunity. The HCWs were openly observed during routine clinical activities. The HCWs were openly observed using hand hygiene audit tool by Infection Control Nurse during routine clinical activities. The observer may observe up to three health-care workers simultaneously, if the density of hand hygiene opportunities permits. The observations were then analyzed according to the healthcare workers’ categories. Data from the grids, compliance of hand hygiene action based on WHO’s hand hygiene audit tool were then entered into the Epi Info Hand Hygiene program.

System Change Initiatives

The observations conducted in the 14 wards of the Surabaya hospital were done as a measure to ensure the availability of the continuous supply of alcohol-based handrub at each point of care and that this was used with efficacy, and tolerability. Ward infrastructure observations were performed by trained observers, every 6 months in all wards and ICUs, using the WHO’s multimodal improvement strategy.

Training and education

Infection control nurse in hospital conducts mandatory training for hand hygiene and infection control for all staff at the professional level, upon commencement of employment. It also conducts a yearly and continuous training for staff. The hand hygiene modules implemented for the hospital are available in each computer at each ward or unit for easy access.

Evaluation and feedback

Evaluation and feedback on hand hygiene compliance at the Surabaya hospital was also conducted frequently through direct observations, ward infrastructure for hand hygiene, and health-care workers’ knowledge on healthcare associated with infections and hand hygiene.

Reminders at the workplace

Another technique applied was to have reminders about hand hygiene compliance at the workplace. The tool to implement this includes prompt reminders to health-care workers about the importance of hand hygiene, and the appropriate indications and procedures when performing it. These reminders also served as a means for informing patients, and their visitors about the standard of care that should be expected from their health-care workers, with respect to hand hygiene (22). During visiting hours, a reminder in the form of a voice paging system emphasizing on the importance of hand hygiene within the hospital area, was also implemented.

Institutional Safety Climate for Hand Hygiene

Institutional safety climate is referred to as an environment that facilitates awareness-raising about patients' safety issues while positioning the hand hygiene compliance as a high priority, at all levels. Patients' involvement is also vital for institutional safety climate. In the outpatient wards, patients could help to promote hand hygiene compliance by handing a reminder card to their doctors to practice hand hygiene.

Data Analysis

As a quantitative study in design, the data collected for hand hygiene compliance before and after the interventions were compared. The SPSS software was applied and the chi-square analysis was performed to determine the significance of hand hygiene compliance improvement among the healthcare workers.

Results

Between 2015 and 2017, a total of 5184 scheduled observations were able to generate 30802 opportunities of hand hygiene compliance. The observations following the trends of the hand hygiene compliance was

noted to have increased every year since 2015. Table 1 illustrates.

Table 1: Hand hygiene compliance at the Surabaya hospital, and the overall compliance for 2015 to 2017

Years	Hand Hygiene opportunities	Hand Hygiene actions	Percent compliance
2015	6736	4853	72.05
2016	12219	101188	82.81
2017	6945	6381	91.88

(Source: Audit report of Surabaya hospital 2015-2017)

The overall hand hygiene compliance from 2015 to 2017 showed a compilation of 25,900 instances. This showed an average compliance of 82.84% - 90% per year. This represents an improvement from previous audits although the statistics is still below the national target of 85%. Table 2 further highlights.

Table 2: Hand hygiene compliance by ward types in Surabaya hospital and the overall compliance for 2015 to 2017

Years	2015			2016			2017		
	HH. OPP	HH Action	% compliance	HH. OPP	HH Action	% compliance	HH. OPP	HH Action	% compliance
Emergency	880	362	41.14	1639	1141	69.62	400	389	97.25
HD	41	34	82.93	129	116	89.92	141	119	84.40
ICU	387	313	80.88	1208	1048	86.75	749	649	86.65
Maternity	1288	734	56.99	1438	1183	82.27	460	412	89.57
Med Sur	2399	2047	85.33	4235	3756	88.69	2598	2430	93.53
OPD	637	511	80.22	1007	811	80.54	460	412	89.57
OT	638	520	81.50	1701	1328	78.07	803	729	90.78
Pediatric	295	168	56.95	441	390	88.44	340	319	93.82
RPK	171	164	95.91	421	345	81.95	176	159	90.34

(Source: Data from infection control audit report Surabaya hospital 2015-2017)

It can be noted that hand hygiene compliance in 2015 to 2017 between ward types that had maintained low results had, overall, increased its compliance. For instance, the emergency wards had increased from 41.14% to 97.25%, the maternity wards had increased from

56.99% to 89.57%, and the pediatric wards had increased from 56.9% to 93.82, upon the implementation of the WHO's multimodal hand hygiene strategy. Table 3 further explains.

Table 3: Hand hygiene compliance by healthcare workers in Surabaya hospital for 2015-2017

*HCW	HH Non compliance		Compliance		Opportunities		P Value	OR
2015	n	%	n	%	n	%		
Physicians	318	29,7	752	70,3	1070	100,0	0,000	2,903
HCA	138	21,7	498	78,3	636	100,0		0,896
Nurse	1.568	24,2	4.908	75,8	6.476	100,0		
TOTAL	2.458	30,0	5724	70,0	8.182	100,0		
*HCW	HH Non compliance		HH Compliance		Opportunities		P Value	OR
2016	n	%	n	%	n	%		
Physicians	744	20,6	2.863	79,4	3.607	100,0	0,000	1,447
HCA	148	11,0	1.199	89,0	1.347	100,0		0,787
Nurse	1.213	14,0	7.474	86,0	8.687	100,0		
TOTAL	2.105	15,4	11.536	84,6	13.641	100,0		
*HCW	HH Non compliance		HH Compliance		Opportunities		P Value	OR
2017	n	%	n	%	n	%		
Physicians	188	11,1	1.499	88,9	1.687	100,0	0,000	1,812
HCA	53	6,0	829	94,0	882	100,0		0,977
Nurse	234	6,1	3.571	93,9	3.805	100,0		
TOTAL	1.687	100,0	882	100,0	3.805	100,0		

(Source: Data from infection control audit report Surabaya Hospital 2015-2017)

* HCW (Healthcare Workers)

The statistics showed that hand hygiene compliance for the different categories of HCWs between years 2015 to 2017 had increased. This showed that the various categories of the HCWs had improved their hand hygiene compliance significantly. Table 4 further outlines this outcome.

Table 4. Hand hygiene compliance by healthcare workers in Surabaya hospital for 2015-2017

Health Care Worker	Percent Compliance 2015	Percent Compliance 2017	P-value
Nursing	75.8%	93.9%	p<0.0001
Physicians	70.3%	88.9%	p<0.0001
HCA	78.3%	94%	p<0.0001

(Source: Audit report Surabaya hospital 2015-2017)

Discussion

Based on the results generated from the observations, it appears that hand hygiene compliance had improved significantly throughout the Surabaya hospital, following the implementation of the WHO's multimodal hand hygiene improvement strategy. This program was introduced mainly based on the strategy of reminders which were installed at the workplace, with the alcoholic hand rubs being introduced as an alternative to soap-and-water handwashing. This improved adherence had been sustained, as observed across most hospital locations, particularly in all types of patient care activities, and also among majority of the healthcare workers working in the wards. Previous attempts to improve the hand hygiene compliance had been associated with, at best, transient improvements (22,23). The most effective measure noted for the improvement was through routine observations, and feedback (24). However, no intervention had been

reported for the long term effect (25,26). The current study had noted a sustained improvement which also complemented an equally sustained intervention. Poor compliance with hand hygiene is common among HCWs. Reported reasons for not washing hands include skin irritations, inaccessible handwashing supplies, wearing of gloves, too busy, or not thinking about it (25-26) Some HCWs had also believed that they should wash their hands only when necessary although observations indicated otherwise (24).

The intervention steps that were conducted in the current study had focused on the use of easily accessed hand hygiene procedures, and the use of posters to campaign as a reminder message (22, 25) In the current study it was observed that most categories of HCWs modified their practices and compliance which had inevitably, improved due to the increased use of alcohol-based hand rub solutions. This intervention was expanded from the previous research experience on attempts to modify HCWs' behavior. The success factors contributing to this study include the multimodal and multidisciplinary approach used, which encompassed the communication and education tools, reminders at the workplace, active participation and feedback at both the individual and organizational level, and the involvement of institutional leaders (25,26) Further to this, special attention had also been implemented on observing the HCWs so as to ensure that they were directly involved in the promotional campaigns which complemented the hospital's goals. Among the interventions used, the most visible component was the posters used by the respective wards that also promoted the hand hygiene campaign.

Behavioral theories and interventions based on these theories have primarily targeted the individuals. This may be insufficient to effect a sustained change (25,26). Doctors' poor compliance with hand hygiene remains an unsolved and vexing issue (23,25,26). Neither the increased staff rotation, nor the lower campaign awareness among doctors, when

compared with other healthcare workers, could explain their low hand hygiene compliance, in the context of this study. Therefore, this outcome needs to be further verified by future research (27). Previous interventions to change doctors' behavior was included education, feedback from patients, rewards and administration changes but this did not seem to have any impact (27). In contrast, the healthcare workers in all categories had increased their hand hygiene compliance until a peak was reached, after which the performance declined (28). This phenomenon had occurred at different times for different HCWs of different categories (28). It is possible that this occurrence may be linked to the sequential targeted interventions. Compliance measurements had been conducted via visible observations which allowed for the segmenting of indications for hand hygiene, and for immediate feedback to be provided. The HCWs' hand hygiene compliance improvements had been significant during the implementation phase. This showed that the project implemented in this study is beneficial to all professional HCWs, on the condition that specific interventions were implemented and their measurements taken periodically and measured adequately. Future research could focus on the behavioral and environmental factors that could also influence hand hygiene compliance, for instance, accessibility and availability of alcohol-based hand rub (AHBR) (28). In the Surabaya hospital, the presence of AHBR is highly recommended. Thus, the influence of locations of the ABHR on hand hygiene compliance could also be examined. These insights can be applied to further improve hand hygiene compliance, and ultimately, decrease HAIs.

Conclusion

This study had presented the rigorous and creative implementation of the WHO's multimodal hand hygiene improvement strategy for promoting hand hygiene compliance. The intervention using the WHO model could be associated with the significant, sustained, and probably, clinically relevant

improvement for hand hygiene compliance, for all professional categories.

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