Sarawak Journal of Pharmacy (2020), volume 6, issue 3, page 35-52

SJP Sarawak Journal of Pharmacy

Journal Homepage: http://jknsarawak.moh.gov.my/spj/

Perception and Perceived Effective Strategies to Improve Hand Hygiene Practice among Inpatient Nurses and Doctors in Miri Hospital

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Introduction: Hand hygiene has been listed as one of the standard precautions to hinder the transmission of multidrug-resistant organisms and is crucial in controlling the transmission. Healthcare workers' hands used to save human lives, yet also the most common vehicles for the transmission of infections. This study aimed to explore and compare the perception and perceived effective strategies to improve hand hygiene practice among inpatient nurses and doctors of Miri Hospital.

Methods: We carried out a descriptive cross-sectional study over four months. A self-administered questionnaire developed by the World Health Organization, was distributed to inpatient nurses and doctors of Miri Hospital with formal consent and was collected once they have completed it.

Results: Patient's reminder to healthcare workers deemed to be the least effective strategy and provision of clear, simple visible hand hygiene instructions to be the most effective strategy. There is a difference in perception of hand hygiene between doctors and nurses and also healthcare workers from good and poor compliance of hand hygiene.

Conclusion: Hospital-associated infection is a preventable condition with good hand hygiene practice as the primary measure for prevention. It is recommended that hand hygiene instructions in Miri Hospital can be updated and be made available in more areas of the hospital.

Keywords: Perception, Perceived Effective Strategies, Hand Hygiene

INTRODUCTION

Nosocomial infections which are also known as hospital-associated infections (HAI) increases the risk of morbidity and mortality among patients, especially those in high-risk settings such as intensive care unit (1). Other than that, nosocomial infections can also lead to other consequences such as additional financial burden, prolonged hospital stay or more severe illnesses (2).

One of the most common nosocomial infections in most of the healthcare settings is multidrug-resistant organisms' transmissions (3,4). Hand hygiene is one of the primary measures to reduce transmission of infection among healthcare workers and patients (3,4). Hand hygiene as defined by the Centers for Disease Control and Prevention (CDC), is a process of cleaning one's hands to reduce potential harmful microorganisms on one's hands (4). The CDC recommends hand hygiene in situations such as before and after treating the patient, after touching objects contaminated with secretions with bare hands or before leaving the treatment room (4).

Hands of healthcare workers (HCW) are the most common vehicles for transmission of nosocomial infections compared to any other forms of contact e.g. airborne or vector-borne (1). There is approximately 90% of most contaminants can be removed via meticulous handwashing with sufficient water and soap (1). Hand hygiene is therefore the predominant initiative to prevent the spread of nosocomial infection and antimicrobial resistance which are also emerging globally throughout the years (2,5).

Healthcare workers' contaminated hands are associated with several healthcare-associated infection endemic and outbreaks (2). World Health Organization (WHO) launched "First Global Patient Safety Challenge – Clean Care is Safer Care" in 2005 and the global invitation sent to countries to commit towards the challenge with main objective to reduce healthcare-associated infection globally (2). Several strategies have been implemented to improve patient safety with healthcare workers hand hygiene as the cornerstone.

A few studies carried out in both developing and developed countries have demonstrated that most healthcare workers' compliance towards hand hygiene is still on an unsatisfactory level, especially nurses and doctors (1,2,6-9). In Miri Hospital, Infection Control Unit conducted hand hygiene

audit quarterly and results have also shown a lack of compliance by healthcare workers such as doctors and nurses towards hand hygiene. For this study, we focused on Miri Hospital inpatient nurses and doctors as they are generally the healthcare workers whom have a longer contact time with patients (10,11). We wanted to have a better understanding of their perception towards hand hygiene and perceived effective strategies to improve own hand hygiene practice.

METHODS

Settings

We conducted the study in inpatient wards of Miri Hospital, Sarawak. Handwashing facilities (e.g. sink, tap water, hand soap and paper towels) and alcohol-based hand rub can be found in all wards, clinics and departments of Miri Hospital. We classified the wards into good compliance and poor compliance towards hand hygiene practice based on the results obtained from Miri Hospital Infection Control Unit (refer Table 1).

Table 1. Wards with Good or Poor Compliance towards Hand Hygiene Practice in Miri Hospital

Good compliance	Poor compliance
Isolation Ward (ISO)	Female Medical Ward (FMW)
Male Orthopedic Ward (MOW)	Male Medical Ward (MMW)
Paediatric Medical Ward (PMW)	Female Surgical Ward (FSW)
Paediatric Surgical Ward (PSW)	Male Surgical Ward (MSW)
Neonatal Intensive Care Unit (NICU)	Female Orthopedic Ward (FOW)
Intensive Care Unit (ICU)	Gynaecology Ward (GYNAE)
Psychiatric Ward (PSY)	Maternity I Ward (MAT I)
Main Operation Theatre (Main OT)	Maternity II Ward (MAT II)
Minor Operation Theatre (Minor OT)	Labour Ward
Endoscopy Unit (ENDO)	Emergency & Trauma Department (ETD)

Study Design and Data Collection

We conducted a descriptive cross-sectional study over four months (1 April 2020 – 31 July 2020). We distributed a questionnaire which was adapted from WHO's perception survey for health care

workers (English version) (12). The questionnaire includes three sections which are: 1) Question 1 – 13 that assess participant's demographic data; 2) Question 14 – 17, 20 – 23 that assess participant's perception of hand hygiene; and 3) Question 19 that assess participant's perceived effective strategies to improve healthcare workers' hand hygiene practice. We omitted question 18 and 24 as is not part of our study objectives. We modified some of the demographics data questions (e.g. Profession, Department) to suit our study environment.

We approached participants in the wards to distribute the questionnaire with formal consent. We informed participant about the study during encounter inwards. We provided and explained an overview of the research. Once the participant agreed to participate, they signed and dated the consent forms. It was a self-administered questionnaire, and each participant was given approximately 15 minutes to complete the questionnaire. We approached the participants again on the same day or when they have completed the questionnaire to collect back the questionnaire.

Study Population

Our target participants are inpatient nurses and doctors in Miri Hospital as they get in contact with patients the most and for a more extended period compared to other healthcare workers. In this study, 92 inpatient nurses and 92 inpatient doctors recruited. Our inclusion criteria are Miri Hospital inpatient nurses, and doctors who can read and understand English, age 18 years old and above. We excluded not those not consented or on long leave.

Sample Size and Sampling

G*Power version 3.1.9.4 used to calculate the sample size for our study. Based on an effect size f = 0.25 (medium), power of 80% (β=0.2), alpha of 0.05, numerator df of 1, the minimum total sample size required is 128 participants. By allowing a 30% non-response rate, the required sample size is 182 participants. We applied the quota sampling method in this study. The final sample size of 184 participants which consists of 92 inpatient nurses and 92 inpatient doctors, and they were divided equally according to the ward, which is of good and poor compliance of hand hygiene practice. The number of questionnaires distributed based on the proportion of the total number of doctors or nurses working in each respective ward, to ensure the representativeness of the sample and increase the external validity of the study.

Statistical Analysis

We analysed data using IBM SPSS Statistics Version 21. Descriptive statistics performed to summarise the perception and perceived effective strategies to improve hand hygiene practice, and the data expressed as mean ± standard deviation. A two-way ANOVA multifactorial analysis used to compare the mean differences in perception of hand hygiene between (a) nurses and doctors, (b) wards with good and poor compliance of hand hygiene practices, and also to determine the interactions between the two factors as listed above. Mann-Whitney U test used to study the relationship between wards with good and poor compliance of hand hygiene practice with the incidence of multidrug-resistant organisms. The p-value of <0.05 is considered as statistically significant.

RESULTS

A total of 184 participants responded to the questionnaire. Majority of them were female. Table 2 and 3 summarised the demographic data of our participants.

Table 2. Demographic data of Study Participants

Gender, n (%)	
Male	53 (28.8)
Female	131 (71.2)
Profession, n (%)	
Doctor	92 (50)
Nurse	92 (50)
Department, n (%)	
Good compliance ward	92 (50)
Poor compliance ward	92 (50)
Received formal training on hand hygiene in the last three years, n (%)	
Yes	149 (81)
No	35 (19)
Routinely use an alcohol-based hand rub for hand hygiene, n (%)	
Yes	154 (83.7)
No	30 (16.3)

Table 3. Participants' Age and Years in Service

Demographic	Mean (years)	Standard Deviation (years)
Age	31.32	5.62
Years in service	6.74	6.14

Our results showed that the average percentage of hospitalised patients who will develop a healthcare-associated infection (HAI) is 46.58% (SD 27.17). For attitude, most participants thought there is high impact of HAI on patient's clinical outcome and most participants believed that hand hygiene is highly effective in preventing HAI. Out of 184 participants, 120 thought that hand hygiene is paramount in their institution (Table 4). Table 5 shows the mean response to WHO Hand Hygiene perception questions – the mean results for all four items were about 6.01 to 6.43 which means participants perceive those efforts or attitudes towards hand hygiene is in between moderately crucial to very important. In Table 6, results show the perceived intervention that may help to improve hand hygiene in Miri Hospital. Patients reminder to healthcare worker deemed to be the least effective, followed by posters, feedback on compliance, availability of hand rub and role model, support from superiors, hand hygiene training and provision of clear, simple visible hand hygiene instructions as the most effective strategy to our participants.

Table 4. Distribution and Mean Response on Individual Hand Hygiene Attitudes

Perception Questions	Respondent Rating, n (%)			Mean (SD)
	Low	High	Very High	
In general, what is the impact of a healthcare-associated infection on patient's clinical outcome?	14 (7.6)	113 (61.4)	57 (31.0)	2.23 (0.58)
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	2 (1.1)	84 (45.7)	98 (53.3)	2.52 (0.52)
Among all patient safety issues, how important is hand hygiene at your institution?	2 (1.1)	62 (33.7)	120 (65.2)	2.64 (0.50)

(Responses coded as 1 = very low, 2 = low, 3 = high, 4 = very high)

Table 5. Mean response to WHO Hand Hygiene (HH) "Perception" Questionnaire

	Perception Questions	Mean	Standard Deviation
Individual HH efforts	How do you consider the effort required by you to perform good HH when caring for patients?	6.43	0.83
Perceived "others" HH Attitudes	What importance does your department attach to the fact that you perform optimal HH?	6.36	0.79
	What importance do your colleagues attach to the fact that you perform optimal HH?	6.21	1.04
	What importance do patients attach to the fact that you perform optimal HH?	6.01	1.18

(Responses coded as 1 = no importance, 2 = moderately not important, 3 = slightly not important, 4 = neutral, 5 = slightly important, 6 = moderately important, 7 = very important)

Table 6. Mean Response to Proposed Hand Hygiene Interventions

Hand Hygiene Intervention	Mean	Standard Deviation
Leader and senior managers at institution support and openly promote HH	6.38	0.76
Availability if alcohol-based hand rub at each point of care	6.30	0.96
Reminder of HH posters displayed at point of care	6.08	1.14
Provision of HH training to each HCWs	6.43	0.82
Clear and simple HH instruction visible to health care-worker	6.46	0.72
HCWs given feedback on HH compliance	6.12	1.05
Each HCW performs HH as a role model for others	6.30	0.88
Patients invited to remind HCWs to perform HH	5.72	1.37

(Responses coded as 1 = no importance, 2 = moderately not important, 3 = slightly not important, 4 = neutral, 5 = slightly important, 6 = moderately important, 7 = very important)

We compared the differences of individual hand hygiene attitude between two groups – doctors and nurses, wards of good compliance and poor compliance towards hand hygiene. We found no significant differences between doctors and nurses on their perceived impact of HAI on patient's clinical outcome, the effectiveness of hand hygiene in preventing HAI, perceived self-effort required to perform good hand hygiene and importance of department to perform optimal hand hygiene. However, there is a difference between them on the importance of hand hygiene at their institution, the importance of colleagues or patients in maintaining their hand hygiene.

Table 7. Mean Differences in Individual Hand Hygiene Attitudes between Doctors and Nurses

Perception Questions	Mean		Mean differences	Standard Deviation	P-value[a]
	Doctor	Nurse			
In general, what is the impact of a healthcare-associated infection on patient's clinical outcome?	2.304	2.163	0.141	0.815	0.097
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	2.533	2.511	0.022	0.211	0.778
Among all patient safety issues, how important is hand hygiene at your institution?	2.533	2.750	-0.217	2.081	***0.003***

[a] *Two-way multifactorial ANOVA*

Table 8. Mean Differences in Individual Hand Hygiene Attitudes between Wards with Good and Poor Compliance of Hand Hygiene Practice

Perception Questions	Mean		Mean differences	Standard deviation	P-value[a]
	Good compliance	Poor compliance			
In general, what is the impact of a healthcare-associated infection on patient's clinical outcome?	2.207	2.261	-0.054	0.517	0.522
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	2.478	2.565	-0.087	0.738	0.260
Among all patient safety issues, how important is hand hygiene at your institution?	2.609	2.674	-0.065	0.700	0.370

[a] *Two-way multifactorial ANOVA*

Table 9. Mean Differences of WHO HH "Perception" Questionnaire between Doctors and Nurses

Perception Questions	Mean		Mean differences	Standard deviation	P-value[a]
	Doctor	Nurse			
How do you consider the effort required by you to perform good HH when caring for patients?	6.467	6.402	0.065	0.623	0.595
What importance does your department attach to the fact that you perform optimal HH?	6.337	6.380	-0.043	1.122	0.711
What importance do your colleagues attach to the fact that you perform optimal HH?	6.054	6.359	-0.304	1.458	***0.047***
What importance do patients attach to the fact that you perform optimal HH?	5.772	6.250	-0.478	1.640	***0.006***

[a] *Two-way multifactorial ANOVA*

For the wards with good and poor compliance, we found no significant differences on questions regarding perceptions on hand hygiene. We also compared the differences between doctors and nurses, wards of good and poor compliance towards hand hygiene on their perceived effective strategies to improve hand hygiene practice. We found no differences between doctors and nurses on approaches such as superiors' support, availability of hand rub, provision of hand hygiene training and role model. However, there are differences between doctors and nurses on strategies such as posters, clear visible hand hygiene instructions, feedback on compliance and patients' reminder. For comparison between wards, there are no significant differences between the wards except on strategies of availability of hand rub and feedback on compliance.

Table 10. Mean Differences of WHO HH "Perception" Questionnaire between Wards with Good and Poor Compliance of Hand Hygiene Practice

Perception questions	Mean		Mean differences	Standard deviation	P-value[a]
	Good compliance	Poor compliance			
How do you consider the effort required by you to perform good HH when caring for patients?	6.478	6.391	0.087	1.180	0.479
What importance does your department attach to the fact that you perform optimal HH?	6.380	6.337	0.043	1.122	0.711
What importance do your colleagues attach to the fact that you perform optimal HH?	6.304	6.109	0.195	1.458	0.201
What importance do patients attach to the fact that you perform optimal HH?	6.120	5.902	0.217	1.640	0.206

[a] *Two-way multifactorial ANOVA*

Table 11. Mean Differences in Proposed Hand Hygiene Interventions between Doctors and Nurses

HH Interventions	Mean		Mean differences	Standard deviation	P-value[a]
	Doctor	Nurse			
Leader and managers at institution support and openly promote HH	6.315	6.446	-0.130	1.074	0.246
Availability if alcohol-based handrub at each point of care	6.304	6.293	0.011	1.352	0.939
Reminder of HH posters displayed at point of care	5.772	5.391	-0.620	1.554	***< 0.001***
Provision of HH training	6.359	6.511	-0.152	1.141	0.204
Clear and simple HH instruction visible to health care-worker	6.326	6.587	-0.261	0.998	***0.013***
HCWs get feedback on HH compliance	5.935	6.304	-0.370	1.448	***0.015***

Table 11. Mean Differences in Proposed Hand Hygiene Interventions between Doctors and Nurses *(con't)*

HH Interventions	Mean		Mean differences	Standard deviation	P-value[a]
	Doctor	Nurse			
Each HCW performs HH as a role model for others	6.272	6.326	-0.054	1.247	0.676
Patients invited to remind HCWs to perform HH	5.489	5.946	-0.457	0.201	***0.024***

[a] *Two-way multifactorial ANOVA*

Table 12. Mean differences to Proposed Hand Hygiene Interventions between Wards with Good and Poor Compliance of Hand Hygiene Practice

HH Interventions	Mean		Mean differences	Standard deviation	P-value[a]
	Good compliance	Poor compliance			
Leader and managers at institution support and openly promote HH	6.446	6.315	0.130	1.074	0.246
Availability if alcohol-based handrub at each point of care	6.457	6.141	0.315	1.352	***0.026***
Reminder of HH posters displayed at point of care	6.087	6.076	0.011	1.554	0.947
Provision of HH training	6.522	6.348	0.174	1.141	0.147
Clear and simple HH instruction visible to health care-worker	6.500	6.413	0.087	0.998	0.408
HCWs get feedback on HH compliance	6.283	5.957	0.326	1.448	***0.032***
Each HCW performs HH as a role model for others	6.370	6.228	0.141	1.247	0.278
Patients invited to remind HCWs to perform HH	5.707	5.728	-0.022	1.928	0.914

[a] *Two-way multifactorial ANOVA*

Table 13. Summary of the analysis of variance (ANOVA) of the factors profession and department on the perceptions and perceived effective strategies to improve hand hygiene

Perceptions and HH interventions	df1	df2	F	P-value[a]
(a) Perceptions questions				
In general, what is the impact of a healthcare-associated infection on patient's clinical outcome?	3	180	3.018	***0.031***
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	3	180	1.050	0.372
Among all patient safety issues, how important is hand hygiene at your institution?	3	180	7.038	***0.000***
How do you consider the effort required by you to perform good HH when caring for patients?	3	180	0.072	0.975
What importance does your department attach to the fact that you perform optimal HH?	3	180	1.572	0.198
What importance do your colleagues attach to the fact that you perform optimal HH?	3	180	2.770	***0.043***
What importance do patients attach to the fact that you perform optimal HH?	3	180	6.506	***0.000***
(b) HH Interventions				
Leader and senior managers at institution support and openly promote HH	3	180	2.264	0.083
Availability if alcohol-based hand rub at each point of care	3	180	5.842	***0.001***
Reminder of HH posters displayed at point of care	3	180	11.084	***0.000***
Provision of HH training to each HCWs	3	180	2.601	0.054
Clear and simple HH instruction visible to health care-worker	3	180	3.801	0.011
HCWs given feedback on HH compliance	3	180	9.852	***0.000***
Each HCW performs HH as a role model for others	3	180	0.165	0.919
Patients invited to remind HCWs to perform HH	3	180	3.628	***0.014***

[a] *Two-way multifactorial ANOVA*

Table 14. Incidence of Multi-Drugs Resistant Organisms between Wards with Good and Poor Compliance of Hand Hygiene Practice

Variable	Wards with good compliance (n=10)	Wards with poor compliance (n=10)	Z statistic[a]	P-value[a]
Incidence of MDRO	9.15	11.85	-1.059	0.289

[a] *Mann-Whitney test*

DISCUSSION

Hospital-associated infection (HAI) is one of the major concerns for healthcare settings worldwide as it leads to morbidity and mortality (1). WHO survey has shown that HAI can affect 9 to 37% of patients in the intensive care unit, and it also concerns 5 – 15% of inpatients (1). Good hand hygiene practice is vital to preventing HAI and resistance of antimicrobials (1,2). This perception was also demonstrated by our participants where more than half of them deemed that hand hygiene is effective in preventing HAI itself.

WHO have listed a few self-reported factors that were said to have influenced healthcare workers' compliance towards hand hygiene (1). For example, insufficient time, lack of role model from superiors, lack of knowledge and lack of active participation in hand hygiene promotion at the individual or institutional level (1). From our study, 81% have received formal training on hand hygiene in the past three years and 83.7% are routine users of alcohol-based hand rub for hand hygiene. There are studies which had demonstrated an increase of compliance towards good hand hygiene practice with the highest being 41% from baseline when healthcare workers received appropriate education and promotional programme on how to improve their hand hygiene practice and compliance towards hand hygiene (13-17). We suggest that hand hygiene training as compulsory training for all healthcare workers.

Studies also showed that when hand hygiene facilities such as alcohol hand rub are made available, the improvement of compliance towards hand hygiene can go up to 14% (14,18-21). It was recommended by WHO that alcohol-based hand rub is the preferred choice of agent when it is available, thus it has advantages such as eliminating the majority of microorganisms compared to other antiseptics such as chlorhexidine, the short onset of action and no need for a facility such as clean water supply (1). However, if hands are visibly soiled, then they will have to be cleaned with

soap and water (1). Nevertheless, it is essential to note that the strategy to improve hand hygiene practice should be multimodal which involves a combination of interventions at once.

Multidrug-resistant organisms (MDROs) as defined by CDC is "microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents" (4). Throughout the last few decades, the incidence of MDROs has been steadily increasing internationally (4). When healthcare workers are not compliant with good hand hygiene practice, it leads to infection and spread of MDRO which is one of the significant contributors to outbreaks worldwide (4). There were few hospital-based studies carried out which has demonstrated a substantial reduction in hospital-associated infections after launching a series of interventions to improve hand hygiene practice (22-25). For example, a study carried out by Grayson et al. in 2008 showed a significant reduction in *methicillin-resistant Staphylococcus aureus* (MRSA) bacteremia events (from 0.03/100 patient-discharges to 0.01/100 patient-discharges per month) when there is good compliance towards hand hygiene (26). This finding is also locally supported by the report we have obtained from Miri Hospital Infection Control Unit, where we found that there is a higher incidence of MDRO inwards who have demonstrated poor compliance towards hand hygiene. The results from these studies do testify to the importance of having satisfactory hand hygiene practice as one of the measures to control events of MDROs.

However, there are a few limitations to our studies. First, there was an unequal number of males and females participants (28.8% and 71.2% respectively) in our studies. WHO mentioned that male gender is one of the observed risk factors for poor compliance towards good hand hygiene practice. Secondly, it runs during the outbreak of Novel COVID-19, which may have changed some of the healthcare workers' perception towards hand hygiene practice. Thirdly, doctors and nurses seldom rotated to different departments throughout their service which may or may not change their perceptions towards hand hygiene practice.

CONCLUSION

Hospital-associated infection is a preventable condition with good hand hygiene practice as the primary measure for prevention. We strongly recommend that related departments of Miri Hospital can consider implementing more or reinforcing interventions to improve the hand hygiene practice further, especially make clear visible hand hygiene instructions to be available in more point-of-cares in Miri Hospital.

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