

Barriers to Hand Hygiene Compliance in the Medicine Wards and Intensive Care Unit of a Tertiary Teaching Hospital in the Philippines

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Abstract

Introduction: Healthcare associated infections (HCAI) continue to be major problems in our institution. Studies have shown that hand hygiene remain to be the primary measure that prevents HCAI. This study aimed to measure hand hygiene compliance rate and determine factors affecting compliance.

Methods: Healthcare workers in the medicine wards and intensive care units (ICU) were directly observed for compliance to the World Health Organization hand hygiene guidelines. In a month period, subjects were selected by convenience sampling. Factors affecting hand hygiene compliance was investigated. Survey of infrastructure and hand hygiene products was concurrently done. Thereafter, self-administered survey was distributed to assess knowledge, attitudes and perceptions toward hand hygiene.

Results: Overall hand hygiene compliance was 11%. Compliance was less likely for doctors, in the ward, and before patient contact. On the other hand, compliance was likely among nurses, in the ICU, before aseptic procedure, after exposure to body fluid, and after patient contact. Demand for hand hygiene was high with mean of

35 (SD=nine) opportunities per hour of patient care. Hand hygiene products are less available in the wards than in the ICU. Sinks are not in convenient locations. Hand hygiene posters were either not visible or lacking. Majority of the survey respondents know at most only two of the five hand hygiene indications.

Discussion: Access to hand hygiene products, training and education, and reminders in the workplace are among the basic requirements in the implementation of hand hygiene programs. With problems related to these three components, hand hygiene compliance is expected to be low.

Conclusion: Low compliance to hand hygiene was associated with professional status, location and indication. Barriers to hand hygiene include inadequate and inaccessible sinks and hand hygiene products in the ward, high demand for hand hygiene, poor knowledge of hand hygiene, and lack of reminders in the workplace.

Keywords: hand hygiene compliance, healthcare associated infections

Introduction

Health-care associated infections (HCAI) remain to be a major problem in most clinical institutions. It affects five to 15% of hospitalized patients in developed countries, with an annual economic impact of approximately six and a half billion in the US and €13-24 billion in Europe.¹ Data on HCAI are limited in developing countries, particularly in the Philippines where data varies among community, city, government and university hospitals. A 1999 study in the Philippine General Hospital (PGH) showed that hospital acquired pneumonia occurs among 28% of patients admitted in the intensive care unit (ICU) resulting to increased mortality rates (from 12.3% to

42.4%) and prolonged hospitalization (from 15.1±12.5 days to 29.7±23.9 days).² A more recent but unpublished surveillance data from the PGH hospital infection control unit (HICU) in 2016 reported HCAI incidence of six and a half percent to 23% per 1,000 patient days in the ICU.

Multiple studies have shown evidence of association between HCAI and infections with drug resistant pathogens. A systematic review by Cardoso et al. in 2015 showed that the odds of getting an infection with potentially drug resistant organisms is four times higher in patients with HCAI compared to those who have community acquired infections.³ Local studies, including that from PGH and University of Santo Tomas Hospital, likewise showed that most cases of multi-drug resistant *Acinetobacter* infections are indeed nosocomial.^{4,5} But apart from this, the rates of multi-drug resistant organisms have been increasing for the past years. Philippine surveillance of antimicrobial resistance from 2015 to 2016 showed increasing rates of extended spectrum beta lactamase-producing *Enterobacteriaceae*, multidrug-

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resistant and extensively drug resistant *Pseudomonas aeruginosa* and *Acinetobacter* species.^{6,7}

At least 20% of HCAI are preventable by appropriate infection control measures.⁸ And among these strategies, hand hygiene is considered to be the primary measure necessary to reduce HCAI.^{1,9} Substantial evidence demonstrated the efficacy of hand hygiene in preventing the spread of infection not only in the hospital but also in the community.¹ Although randomized controlled trials are lacking, several studies have shown reduction in HCAI rates¹⁰⁻¹² and cross transmission of drug resistant pathogens particularly methicillin-resistant *Staphylococcus aureus*.¹³⁻¹⁵ Between handwashing and handrubbing with alcohol solutions, the latter showed greater efficacy in reducing transient¹⁶ and drug resistant organisms.^{17,18} The Centers for Disease Control and Prevention and the World Health Organization (WHO) recommends handrubbing with alcohol-based solution for routine hand antisepsis except when hands are visibly soiled or possibly exposed to spore-forming organisms which necessitates handwashing with soap and water.^{1,19}

Although the value of hand hygiene is universally known and the practice simple, overall compliance is unacceptably low among health care workers (HCW). WHO reviewed studies from 1981 to 2008 showing baseline hand hygiene adherence of five percent to 89% with an overall average of 38.7%.¹ The wide range of values could have resulted from differences in definition of adherence and as well as observation. This was addressed in 2009 when WHO published guidelines which standardized definitions and methods for observation.

Factors contributing to hand hygiene noncompliance have been extensively studied. Identified factors include: skin irritation by hand hygiene agents, inaccessible supplies, interference with patient-HCW relationship, patient needs perceived as priority over hand hygiene, wearing of gloves, forgetfulness, lack of knowledge of guidelines, insufficient time for hand hygiene, high workload and understaffing.²⁰⁻²⁴ Conversely, there were also factors identified to improve adherence such as: introduction of accessible alcohol-based handrub, sink automation, years of practice, training, incentives, recognition, penalty, administrative support, prioritization and active participation at institutional level.^{10,12,25,26}

In our institution, hand hygiene is being promoted for years. Strategies were mainly focused on information dissemination through lectures, posters, and training workshops conducted annually. Hand hygiene surveillance was only done in high risk areas (ICU), showing a very dismal three percent compliance rate recorded in the medical ICU for the year of 2011 (unpublished). However, this data was from random observation in the ICU, consisting only of 70

opportunities observed in nine sessions of 120-minute each. Apart from that, observations were not yet standardized in accordance to the 2009 WHO guidelines. There have been efforts to provide hand hygiene products at point of care but a lot of the products went missing. Also, reasons as to why wall-mounted hand hygiene products are rarely used remains to be investigated.

Thus, this study was conducted in 2012 to establish baseline data on hand hygiene compliance in accordance to the 2009 WHO guidelines. It also probed into the factors that affected compliance and whether results were similar to existing studies. Study results led to a multifaceted intervention to improve hand hygiene in 2014.

Methodology

The study was conducted in PGH, a tertiary referral center and teaching hospital administered by the University of the Philippines (UP). It is the largest government training hospital in the Philippines with about 1,500 bed capacity, annual average of 600,000 patients, and over 800 trainees, 600 medical students, and 4,000 employees.²⁷ Observations were limited to the Medicine female ward (48 beds), male ward (50 beds) and ICU (12 beds).

The wards are open with patient beds that are arranged in four rows and are approximately three feet apart. Rows are lined opposite each other and separated by a discontinuous cement wall. All of the beds are visible from the center aisle. In each ward, there is one isolation room for immunocompromised patients consisting of five patient beds. All patients are visible from the center of the rooms. In the ICU, beds are lined in two opposite rows with bed distances of about four to five feet. These beds can be separated by curtain dividers, but nonetheless are visible from the center aisle. For both the wards and ICU, there is at least one isolation room for patients with highly communicable diseases. These rooms have large glass windows or walls which allow monitoring of general patient status and all patient care activities from outside the rooms.

Direct observation of hand hygiene practices over a one-month period was done at different times of the day and days of the week to ensure that differences in the density of opportunities were accounted. Eligible subjects include doctors, nurses and students who entered the patient zone, defined as the area which includes the patient and surfaces or items that are temporarily or exclusively dedicated to him or her.²⁸ Subjects were selected by convenience sampling.

The primary investigator trained in accordance with the WHO hand hygiene guidelines and recorded observations on their prescribed form.²⁸ Observations were done discreetly, as far as possible from the subjects yet making sure that

patient care activities were still visible. At most two persons were observed at a time. Subjects were observed up to a maximum of 20 minutes or until completion of patient care episode, whichever comes first, before moving on to another subject. The availability and accessibility of hand hygiene products and posters were concurrently evaluated.

Self-administered questionnaires evaluating knowledge, perceptions and attitudes toward hand hygiene were distributed (Appendix A). Questions were patterned from existing studies,^{29,30} and modified specifically for the PGH setting. Survey items assessed different cognitive aspects toward hand hygiene. Submission of accomplished forms implied consent.

Opportunities for hand hygiene and compliance were assessed based on the 2009 WHO hand hygiene guidelines. An opportunity for hand hygiene was identified whenever an indication exists, whether single or multiple. Hand hygiene between a contaminated site to another site in the same patient was also considered as an opportunity for hand hygiene. The main outcome was hand hygiene compliance, either by handwashing with soap and water, or handrubbing with an alcohol-based solution for every opportunity for hand hygiene. Inability to perform hand hygiene when indicated corresponds to noncompliance. Failure to remove gloves after patient contact or between a contaminated and clean body site on the same patient was also considered noncompliance.

Study variables included: professional status, sex, location, time of day, day of the week, glove use, and activity index. Activity index represents hand hygiene demand (number of opportunities per hour of patient care).²⁸

Knowledge of hand hygiene was measured by the number of hand hygiene indications that survey participants were able to enumerate (refer to Appendix A). These five moments of hand hygiene include (1) before patient contact, (2) before clean or aseptic procedures, (3) after body fluid exposure risk, (4) after patient contact, and (5) after contact with patient's surroundings.

Sample size was calculated using the expected correlation coefficient of 0.39 based on similar existing studies. With a level of significance of five percent, margin of error of 0.2, and $\alpha = 0.1$, at least 366 opportunities for hand hygiene must be observed to estimate hand hygiene compliance rate.

Association with hand hygiene compliance were investigated using chi square for categorical variables and logistic regression for correlation with activity index. The magnitude of association was measured by odds ratio with 95% confidence intervals. All tests were two-tailed, and a p value less than 0.05 was considered statistically significant.

Microsoft Excel and GraphPad software were used for statistical analyses.

The UP Manila Research Ethics Board approved the protocol as a researcher-initiated study on quality of care. The Department of Medicine and HICU were notified of the conduct of the study; but schedule of observations were withheld. Anonymity was maintained by omitting names from the data record. After completion of the study, results were reported in department conferences, lectures and meetings with the hospital staff.

Results

A total of 394 patient care episodes which provided 1,176 opportunities for hand hygiene were observed over 36 hours of observation. Overall hand hygiene compliance was 11% (n=125). Handwashing (8%) was preferred over handrubbing with alcohol-based solution (3%). Majority performed handwashing for most indications except before doing aseptic procedures when handrubbing with alcohol-based solution was preferred. Table I shows the distribution of opportunities over different study variables.

Compliance differed significantly by professional status, location and hand hygiene indication. The likelihood of hand hygiene compliance was higher for nurses, in the ICU, before aseptic procedure, after body fluid exposure risk and after patient contact. On the other hand, adherence was less likely for doctors, in the wards and before patient contact.

Glove use contributed to about 14% (n=143) of missed opportunities for hand hygiene. Moreover, gloves were not changed as often as needed especially in between patient contact except when exposed to body fluids.

The average activity index was 35 (SD=nine) opportunities per hour of patient care. Figure 1 shows a trend toward decreased compliance with increased activity index, however was not statistically significant.

In the ICU, hand hygiene solutions at the entrance and at the nurses' station were supplemented by alcohol-based solutions at point of care. However, supplies of soap and hand towels in sink areas were not maintained. Sinks are only present at the nurses' station.

In the wards, alcohol-based solutions at point of care were lacking and alcohol placeholders were not being utilized. This was partially compensated by patients and HCW who provide their own handrub solutions. And just like in the ICU, supplies of soap and hand towels in sink areas were not maintained. Sinks are present at the nurses' station and at far corners of the wards.

Only posters on proper handwashing were visible in the

Table I. Distribution of 1,176 hand hygiene opportunities observed within 36 hours of observation and factors associated with hand hygiene compliance in PGH medicine wards and ICU

Variables	Opportunities n (%)	Compliance %	Chi square p value	Odds ratio (95% CI)
Professional status				
Doctor	248 (21)	6	18.9 p<.001	0.44 (0.25 – 0.78)
Nurse	424 (36)	16		
Student	504 (43)	9		
Sex				
Male	451 (38)	11	0.48 p=0.49	1.16 (0.80 – 1.70)
Female	725 (62)	10		
Location				
Female ward	414 (35)	11	14.66 p<.001	1.00 (0.68 – 1.47)
Male ward	425 (36)	7		
ICU	337 (29)	15		
Time of day				
Morning (6am-12nn)	418 (36)	10	1.99 p=0.37	0.87 (0.59 – 1.29)
Afternoon (12nn-6pm)	413 (35)	12		
Night (6pm-6am)	345 (29)	10		
Day of the week				
Weekdays	653 (56)	12	3 p=0.08	1.43 (0.97 – 2.09)
Weekends	523 (44)	9		
Use of gloves				
Yes	165 (14)	13	0.05 p=0.82	1.64 (1.00 – 2.70)
No	1011 (86)	12		
Indication*				
Before patient contact	760 (46)	5	54.37 p<.001	0.32 (0.22 – 0.48)
Before aseptic procedure	76 (5)	17		
After body fluid exposure risk	44 (3)	30		
After patient contact	740 (45)	12		
After contact with patient's surroundings	15 (1)	0		

* Total number of indications: 1,635

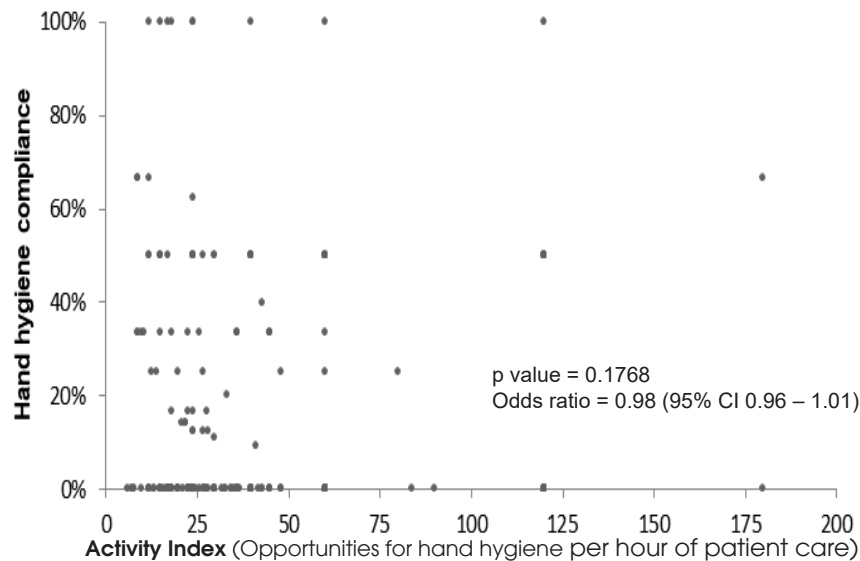


Figure 1. Scatter plot of activity index – related hand hygiene compliance among PGH health care workers in the medicine ward and ICU (Logistic regression analysis). Infrastructure survey

Table II. Survey of knowledge and preference for hand hygiene of 124 healthcare workers in the PGH medicine wards and ICU

Survey Items	Doctors n = 50	Nurses n = 32	Students n = 42	Overall N (%)
Hand Hygiene training	46	31	41	118 (95)
Knowledge of hospital policy on hand hygiene	48	33	40	121 (98)
Knowledge of five moments of hand hygiene *				
0	19	16	2	37 (30)
1	6	2	2	10 (8)
2	5	5	11	21 (17)
3	8	5	8	21 (17)
4	9	0	10	19 (15)
5	2	5	9	16 (13)
Preference for hand hygiene†				
Soap and water	27	17	22	66 (53)
Alcohol-based solution	5	0	4	9 (7)
Either	17	15	16	48 (39)

* Knowledge was measured by the number of hand hygiene indications (WHO five moments of hand hygiene) correctly enumerated

† One respondent did not give an answer

wards and ICU. Reminders on the five moments of hand hygiene and the use of alcohol-based solution were lacking.

About 124 HCW submitted accomplished survey forms. Table II shows the result of different parameters assessing knowledge of hand hygiene. Majority reported knowledge of hand hygiene and had also attended training. However, further testing revealed that most participants have knowledge of at most only two hand hygiene indications. Most commonly cited indications were after patient contact (n=72), before patient contact (n=68), and before aseptic technique (n=53). Average self-reported compliance was 7 (SD=2) in a 10-point scale.

The reported reasons for noncompliance were lack of hand hygiene products (n=73), busy schedule (n=70), forgetfulness (n=49), inaccessible hand hygiene products (n=43), and lack of prioritization for hand hygiene over other tasks (n=27). Other reasons include: skin irritation, unsure of need, and unpleasant odor of available hand sanitizer.

Health care workers have a general positive response on time-related (86%), ethical and accountability-related (99%), and usefulness-related (98%) questions on hand hygiene (Appendix B). Majority (95%) were motivated to improve compliance with provision of more hand hygiene products. The overwhelming response was for the hospital to provide adequate, accessible and acceptable hand hygiene products. Other suggestions include: frequent reminder in the workplace, adequate staffing, performance feedback, and administrative commitment to implement hand hygiene.

Discussion

Compliance to hand hygiene was low. Identified barriers to compliance include lack of hand hygiene products, inadequate knowledge of hand hygiene indications, and lack of reminders in the workplace. These three factors are among the five basic requirements in the implementation of hand hygiene programs as recommended by the WHO.¹ Indeed, without these basic requirements compliance is expected to be low.

Another barrier to compliance was the high demand for hand hygiene in our setting. With this, the WHO recommendation of handrubbing with alcohol-based solution for routine antiseptics¹ cannot be overemphasized. This is very important given that most HCW preferred handwashing with soap and water over the use of handrub solutions. Then again, the problem on understaffing should also be addressed, as it also contributes to the high workload among the hospital staff.

Other important issues that should be addressed in devising a strategy to improve hand hygiene compliance include: appropriate glove use and acceptability of hand hygiene products to HCW. Education and training should focus on correcting the practice that gloves can be used in place of hand hygiene. Again, gloves are intended to complement and not replace hand hygiene. Handrub solutions should be of acceptable quality to encourage HCW to do hand hygiene.

Compliance was lowest even with commonly cited hand hygiene indication – that is, before patient contact. Students who demonstrated better knowledge of these indications were outperformed by nurses in practice. Indeed, hand hygiene practice is complex and other factors such as years of clinical practice, type of patient care activities performed and working condition could have affected the result.

As in our study, self-report overestimated true compliance. Hence, we should utilize other methods of monitoring compliance such as direct observation, monitoring of hygiene product consumption, and automated monitoring systems.¹

The problem on hand hygiene encompasses resources, working condition, cognition and behavior. Therefore, hand hygiene interventions should be multifaceted, as recommended by the WHO. A systematic review in 2016 showed that a multimodal approach resulted to moderate improvement in hand hygiene compliance.³¹ In our setting, administrative commitment, funding, staffing, education and training, regular surveillance, and performance feedback are necessary to improve hand hygiene compliance.

Biases and Limitations

1. Study findings may not be similar to other areas in the hospital.
2. The quality of handwashing or handrubbing was not assessed.
3. Some health care workers might have noticed being observed and performed better than usual.
4. Since only one of the researchers did the observations, observation bias may exist. This was minimized by strictly adhering to the WHO guidelines.

Conclusion

Hand hygiene compliance was low (11%). Location, professional status and hand hygiene indications significantly affected compliance. Barriers to hand hygiene compliance include: inadequate and inaccessible hand hygiene products, poor knowledge of hand hygiene indications, lack of reminders in the workplace, and high workload. A multifaceted approach to improve hand hygiene compliance should be devised.

Conflicts of interest. R.P.B. is the head of the PGH Hospital Infection Control Unit. However, observations were performed solely by A.G.M. Hence, authors report no conflicts of interest relevant to this article.

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APPENDIX A.
Self-administered Survey Questionnaire

Sex: o Male o Female
 Profession: o Doctor o Nurse o Student

1. Is there a hand hygiene policy in the hospital that you are aware of?
 Yes No Don't Know

2. Did you receive any lecture or training regarding proper hand hygiene?
 Yes No Cannot recall

3. Do you know the WHO recommended indications for hand hygiene?
 Yes No Not entirely

4. Please list down the WHO 5 moments of hand hygiene that you are aware of.

- (1) _____
 (2) _____
 (3) _____
 (4) _____
 (5) _____

5. In a scale of 1 to 10, rate your hand hygiene compliance based on the WHO recommendations. Encircle your answer.

Never	Sometimes						Always		
1	2	3	4	5	6	7	8	9	10

6. Which products do you prefer to disinfect your hands? Check one.

- soap and water
 alcohol-based solution
 either soap and water, or alcohol-based solution
 other disinfectant (please specify) _____

7. When you **DO NOT** disinfect your hands when you should, what is the reason? You can check more than one.

- Too busy
 Forget
 Unsure of need
 There are more important things to do
 Out of products (soap, water, alcohol, etc.)
 Products not in convenient location
 Skin irritation
 Other reasons (please specify) _____

8. Washing hands whenever recommended would mean loss of precious time.

 Yes No

9. Washing hands saves lives.

 Yes No

10. Do you feel bad when you are not able to wash your hands sufficiently?

 Yes No Sometimes

11. Are you completely convinced of the usefulness and importance of hand hygiene?

 Yes No

12. Would you perform hand hygiene more often if more sinks and alcohol dispensers are available?

 Yes No Not sure

13. If the hospital could do one thing to help you practice hand hygiene, what would it be?

APPENDIX B

Assessment of individual cognitive factors related to hand hygiene

Variable	Item #
Knowledge of hospital policy	1
Perception of knowledge of hand hygiene indications	3
Actual knowledge of hand hygiene indications	4
Perception of hand hygiene compliance	5
Perception of factors contributing to noncompliance	7
Perception of being able to behave as desired (self-efficacy)	12
Time-related attitude	8
Ethical and accountability-related attitude	9, 10
Usefulness-related attitude	11