

# Compliance in Maintaining Hand Cleaning on Health Care Workers in Neonatology Unit in Tertiary Referral Hospital Indonesia : The Usage of CCTV for Supervision

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## Abstract

**Background:** Hand hygiene is an effort to overcome Healthcare-associated Infections especially in the neonatology unit but the implementation in various hospitals is still not in accordance with the standards.

**Aim:** The study is aimed to determine the health care workers compliance in maintaining hand cleaning monitored through CCTV as a media of supervision.

**Method:** An observational descriptive study was conducted with a cross sectional approach in the highest referral hospital in East Java Indonesia. All health care workers in the Neonatology Unit, who was on duty and recorded by CCTV, was involved in the research during the observation, both nurses, doctors, college students, health care workers, and cleaning services. Hand hygiene compliance was assessed using the WHO observation sheet.

**Result:** The study revealed that hand hygiene compliance on health care workers in the Neonatology Unit as a whole was 74.5%. Based on five moments for hand hygiene, 83.3% were obtained before contact with patients, 100% before taking aseptic action, 90% after risk of exposure to body fluids, 74.5% after contact with patients, and 42.2% after contact with the environment patient. Of the five indicators, one indicator did not meet the hospital's target. Based on the profession category, the hand hygiene compliance was found 78.4% in nurses, 30% in doctors, 78% in college students, and 22.2% in others.

**Conclusion:** Hand hygiene compliance on health care workers are found to vary based on five moments for hand hygiene and professional categories of health care workers.

**Keywords:** *Hand hygiene, health care workers, neonatology units, CCTV, referral hospital*

## Introduction

Nosocomial infection or currently referred to as Healthcare-Associated Infections (HAIs) is still a health problem in various countries in the world, including Indonesia. Hundreds of people around the world die from infections acquired when receiving health services<sup>[1]</sup> The neonatology unit is a place with a high risk of HAIs which is one of the main causes of death in neonates.<sup>[2]</sup>

Prevention of the transmission of harmful germs needs to be done to reduce the incidence of HAIs. Hand hygiene is a simple action that can save many people if done at the right time and in the right way through five moments for hand hygiene.<sup>[3]</sup> Hand hygiene is one of the efforts that must be applied in all health service facilities and carried out by all health care workers, as a sign of competence, professionalism and responsibility.<sup>[4]</sup> Therefore, compliance with hand hygiene becomes a crucial part of health services in hospitals.

Strict hand hygiene compliance can reduce the risk of cross infection. The policy in developing countries regarding compliance monitoring is urgently needed for the application of basic infection prevention practices

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in health care arrangements.<sup>[5]</sup> Periodic environmental supervision including health care workers who provide services can give advantage at avoiding irrational antibiotics usage.<sup>[6]</sup> Long-term hand hygiene compliance can be done by direct monitoring and feedback on the results of monitoring.<sup>[7]</sup>

Direct observation is still the “gold standard method” for assessing hand hygiene compliance.<sup>[8]</sup> In India for example, in which technology for monitoring compliance may not be available, direct observation remains the main standard.<sup>[9]</sup> However, camera-based systems or Continued Circuit Television (CCTV) can be used to monitor the health care workers hand hygiene compliance in accordance with five moments of hand hygiene. The process of observation is direct and continuous in order to avoid the occurrence of the Hawthorne effect, which is a person’s behavior that is different from usual, caused by feelings being observed in a study.<sup>[10]</sup> CCTV monitoring is the most appropriate, reliable, and neutral method for observing hand hygiene compliance because observation is carried out directly and closed so as to hinder bias from the results of the study.<sup>[11]</sup>

The hospital chosen is the highest referral hospital in East Java Indonesia with the Joint Commission International (JCI) accreditation standard which establishes hand hygiene compliance as one indicator of the health services quality.<sup>[12]</sup> The Neonatology Unit has CCTV monitoring facilities that can be used to monitor health care workers hand hygiene compliance adequately. This study is henceforth aimed to examine the health care workers hand hygiene compliance monitored through CCTV as a media of supervision in The Neonatology Unit.

## **Material and Method**

The present observational descriptive study with a cross sectional approach was carried out at the first level referral hospital in East Java Indonesia (Dr. Soetomo Hospital) for 5 months in 2017-2018. All health care workers working in the Neonatology Unit of Dr. Soetomo Hospital, namely the profession category of nurses, doctors, college students, health care workers, and cleaning services represented by officers who were on duty and recorded in CCTV videos when observations were made. The sampling technique used was accidental sampling.

Health care workers hand hygiene compliance was measured through 5 WHO moments, namely before touching patient, before aseptic procedures, after body fluid exposure/risk, after touching a patient and after touching patient surroundings. Data collection was carried out by observing hand hygiene using the WHO observation sheet through 3 (three) CCTVs installed. Observations were carried out in a closed manner by looking at CCTV videos in a one-hour special room so that a total duration of 7 hours was reached for 1 week. The research variables were the amount of hand hygiene opportunities considered as hand hygiene moments compared to hand hygiene attitude in accordance with the moments performed. The researcher was assisted by the research team in the observation to obtain objective data so that it was done repeatedly until the results of both observations had similarities. The obtained data was described descriptively.

## **Result**

In the research location, the location of the sink and soap dish was quite strategic to do hand hygiene using handwash techniques also alcohol handrub was available on each storage cabinet next to the incubator and open baby box. The clerk had 660 hand hygiene opportunities during the observation. Nearly half of the opportunities for hand hygiene of 258 opportunities (39.1%) occurred in the moments before contact with patients, and a small percentage of opportunities were 11 opportunities (1.7%) occurred in the moments before taking aseptic action. Every profession had different opportunities and opportunities depending on work procedures and care that was done. Most opportunities with a total of 388 opportunities (58.8%) occurred in the nurse profession category, and a small percentage of opportunities were 9 opportunities (1.4%) occurred in other professions categories.

Health care workers hand hygiene compliance was described according to five moments and the type of profession presented in table 1. In table 1 it was noted before carrying out aseptic actions, the hand hygiene compliance was 100% while after contact with the patient’s environment as many as 42.2% compliance was obtained. According to the profession category, nurse compliance was considered as the largest percentage with the total amount of 78.4% while other professions such as cleaning services, and other health care workers had the lowest compliance of around 22.2%

**Table 1. Health care workers hand hygiene compliance based on five moments of hand hygiene and profession category**

Category	Opportunities(n)	Attitude (n)		Compliance (%)
		Action	Missed	
Five moments hand hygiene				
Before touching patients	258	215	43	83.3
Before aseptic procedures	11	11	0	100
After body fluid exposure/risk	50	45	5	90
After touching patients	239	178	61	74.5
After touching patients surroundings	102	43	59	42,2
Total	660	492	168	74.5
Profession				
Nurse	388	304	84	78.4
Doctor	40	12	28	30
College student	223	174	49	78
Others	9	2	7	22.2
Total	660	492	168	74.5

Table 2 described the hand hygiene compliance by profession based on on five moments. The result of the greatest hand hygiene compliance before contact with patients was found in college students with the numbers that were not far from nurses while doctors did

handwashing more than half the chance (53.8%). Hand hygiene compliance before contact with patients had the greatest number of opportunities. The biggest percentage of adherence to hand washing before aseptic action was 100% for both college students and nurses.

**Table 2. Hand hygiene compliance by profession based on five moments**

Category	Opportunities	Attitude		Compliance (%)
		Action	Missed	
Before touching patients				
Nurse	157	132	25	84.1
Doctor	13	7	6	53.8
College student	88	76	12	86.4
	258	215	43	83.3
Before aseptic procedures				
Nurse	10	10	0	100
College students	1	1	0	100
	11	11	0	100
After body fluid exposure/risk				
Nurse	31	29	2	93.5
College student	19	16	3	84.2
	50	45	5	90
After contacting patients				

**Cont... Table 2. Hand hygiene compliance by profession based on five moments**

Nurse	139	108	31	77.7
Doctor	9	4	5	44.4
College student	91	66	25	72.5
	239	178	61	74.5
After touching patients surrounding				
Nurse	51	25	26	49
Doctor	18	1	17	5,6
College student	24	15	9	62,5
Others	9	2	7	22,2
Total	102	43	59	42,2

### Discussion

The number of opportunities obtained was sufficient to obtain adequate results. Assessment of hand hygiene compliance, needed a minimum of 200 hygiene opportunities occurred during the assessment period. In this study, the hand hygiene compliance in the neonatology unit is good category. There was one moment with results that had not reached the standard at the time after contact with the patient's environment. The results obtained were not in accordance with the results of the research conducted in the short term given to the research obtained from the results of no more than 40% [1] Hand hygiene compliance was good if the percentage of hand hygiene reached  $\geq 50\%$ , while it was considered poor if the percentage hand hygiene  $< 50\%$ . [13] Whereas other sources of reference mentioned that the average compliance level in accordance with the recommended hand hygiene technique among healthcare workers was 78%, which was below the 90% benchmark for critical care fields.<sup>[9]</sup> Target for hand hygiene compliance in the health care institution was set to  $> 90\%$ , in which regarded as a very high value, unachievable and unrealistic.<sup>[14]</sup> The decision of hand hygiene compliance target must be realistic and could be agreed upon, because it needed to be done long-term in improving hand hygiene itself. [3] There was no fixed target agreed internationally for ideal hand hygiene compliance, so that it was necessary to determine the target of each institution carried out as part of the assistance to improve the quality of the care unit<sup>[15]</sup>

The factors that most caused healthcare workers to be disobedient in carrying out hand hygiene were limited time, large number of jobs must be done, lack of knowledge, skepticism about hand hygiene as a method of prevention, not strategic placement of sinks

and soaps, and lack of motivation in improving hand hygiene compliance.<sup>[16]</sup> Other studies suggested that easy and adequate access, pre-survey orientation programs and training were not ensuring adequate compliance. Continuous training, performance feedback and verbal reminders would be needed to maintain compliance with hand hygiene.<sup>[9]</sup>

The ease of facilities was seen at the time of observation so as to support the achievement of good hand hygiene compliance. Most hand hygiene opportunities occurred on moments before contact with patients and after contact with patients. These two moments often occurred simultaneously, for example when a health worker completed an action from one patient, then took action on another patient. Hand hygiene opportunities at moment 1, 4, and 5 were the most likely to occur, which was about 80% of all opportunities for hand hygiene by healthcare workers.<sup>[17]</sup>

The compliance rate was based on five moments and the type of profession varies. Previous research found the different things. Some found that nurses dominated hand hygiene opportunities but there were also those who found professions and other health workers.<sup>[18]</sup> This happened because each hospital had different procedures and division of labor. In general, nurses had an important role in caring for patients in research. The variation in compliance with hand hygiene in each occupation was likely to be caused by constant nurse contact with patients so that the opportunity for hand hygiene that occurred to nurses was higher than other professions.<sup>[19]</sup> Healthcare workers who made a lot of contact with patients needed to have high hand hygiene compliance.<sup>[20]</sup>

Various policies needed to be developed related to hand hygiene compliance monitoring. Accuracy of

monitoring procedures and hand hygiene compliance was essential in order to protect patients and health care workers from infections related to health care. Training on the quality of observations and patient involvement in improving hand hygiene compliance monitoring needed to be considered.<sup>[21]</sup> In addition to general compliance indicators, procedures such as monitoring and recording compliance periodically, providing feedback to personnel regarding staff performance, and monitoring the volume of alcohol-based swabs (or detergents) used for hand washing or hand antisepsis) used per 1,000 patient-days. In addition, when an outbreak of infection occurred, it was necessary to assess the adequacy of hygiene of health care workers hands.<sup>[22]</sup> Installation of CCTV could be considered as an additional medium to monitor the implementation of hand hygiene.

The limitation in this study is that it can only assess hand hygiene compliance based on five moments of hand hygiene recommended by WHO, unable to assess hand hygiene techniques through CCTV, the use of video recordings from three different cameras, the need for several people in observation and repetition, and limited time research. So the future research may study hand hygiene techniques, and conduct the same research in the long term.

### Conclusion

Hand hygiene compliance of healthcare workers was found to vary based on five moments of hand hygiene and professional categories of healthcare workers. Of the five moments, one moment does not meet the target, namely healthcare workers' hand hygiene compliance after contact with the patient's environment.

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**Ethical Clearance:** This research has gone through ethical testing in the Ethics Committee Dr. Soetomo Hospital Surabaya Indonesia with the ethical code 0021 / KEPK / II / 2018

**Conflict of Interest:** The authors declare that there is no conflict of interest

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### References

1. WHO. Guide to Implementation: A Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy. Geneva: WHO; 2009.
2. Sadowska-Krawczenko I, Jankowska A, Kurylak A. Healthcare-associated infections in a neonatal intensive care unit. Archives of Medical Science [Internet] 2012;5(5):854–8. Available from: <http://www.termedia.pl/doi/10.5114/aoms.2012.31412>
3. WHO. WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care is Safer Care. Geneva: WHO; 2009.
4. Longtin Y, Sax H, Allegranzi B, Schneider F PD. "Hand hygiene." The N Engl J Med 2011;364:24.
5. Purva Mathur. Hand hygiene: Back to the basics of infection control. Indian J Med Res 2011;134(5):611–20.
6. Kumar S, Shankar B, Arya S, Deb M, Chellani H. Healthcare associated infections in neonatal intensive care unit and its correlation with environmental surveillance. Journal of Infection and Public Health [Internet] 2018;11(2):275–9. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S187603411730206X>
7. Arise K, Nishizaki S, Morita T, Yagi Y, Takeuchi S. Continued direct observation and feedback of hand hygiene adherence can result in long-term improvement. American Journal of Infection Control [Internet] 2016;44(11):e211–4. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0196655316307362>
8. Bearman G, Munoz-Prize S, Morgan D MR (ed). Infection Prevention: New Perspectives and Controversies. Switzerland: Springer Nature (ebook);
9. Chavali S, Menon V, Shukla U. Hand hygiene compliance among healthcare workers in an accredited tertiary care hospital. Indian Journal of Critical Care Medicine [Internet] 2014;18(10):689–93. Available from: <https://www.ijccm.org/doi/10.4103/0972-5229.142179>
10. Boyce JM. Electronic monitoring in combination with direct observation as a means to significantly improve hand hygiene compliance. American Journal of Infection Control [Internet] 2017;45(5):528–35.

Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0196655316310963>

11. Brotfain E, Riven IL, Gushanky A, Erblat A, Koyfman L, Ziv T, Odes, LS K, M BA. Monitoring the hand hygiene compliance of health care workers in a general intensive care unit: Use of continuous closed circle television versus overt observation". *American journal of infection control* 2017;45(8):849–54.
12. JCI. *Joint Commission International Accreditation Standards for Hospitals*. 5th ed. Illinois US: The Joint Commission International.; 2013.
13. Abdella NM, Tefera MA, Eredie AE, Landers TF, Malefia YD, Alene KA. Hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Gondar, North West Ethiopia. *BMC Public Health* 2014;14(96):1–7.
14. Oliver C, Thompson A CR. In defence of high hand hygiene compliance rates". *Journal of Hospital Infection* 2017;97(1):31–2.
15. HPCG. *Hand Hygiene Evaluation: Report prepared for the Health Quality and Safety Commission*. Auckland: HPCG; 2014.
16. Marra AR EM. New technologies to monitor healthcare worker hand hygiene. *Clin Microbiol Infect* 2014;20:29–33.
17. Dawson CH MJ. Review of technologies available to improve hand hygiene compliance – are they fit for purpose? *Journal of Infection Prevention* 2014;5(6):222–8.
18. Belela-Anacleto ASC, Kusahara DM, Peterlini MAS PM. Hand hygiene compliance and behavioural determinants in a paediatric intensive care unit: An observational study. *Australian Critical Care* 2018;XXX:1–7.
19. Mustarim RR. The relationship of hand washing compliance to the incidence of bloodstream infections in neonatal units before and after education. *Sari Pediatri* 2017;18(6):443–7.
20. Zottele C, Magnago TSBS, Dullius AIS, Kolankiewicz ACB OJ. Hand hygiene compliance of healthcare professionals in an emergency department. *Rev Esc Enferm USP* 2017;51:108.
21. Humberto Guanche Garcell , Ariadna Villanueva Arias, Fernando Ramírez Miranda, Reynol Rubiera Jimenez and RNAS. Direct observation of hand hygiene can show differences in staff compliance: Do we need to evaluate the accuracy for patient safety? *Qatar Med J* 2017;2(1).
22. CDC. *Guideline for Hand Hygiene in Health-Care Settings*. 2002;