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RESEARCH **Open Access**

Is Infection Prevention and Control Training Can Increase Knowledge and Compliance of Nurses?

Ni Made Nopita Wati[1a*], Elmy Subyaktien[2b], Tri Rahyuning Lestari[3c], Diah Pusparini Pendet[4d], Nunung Rachmawati[5e], I Gede Juanamasta[1f], Yupin Aungsuroch[6g]

[1] Department of Nursing, STIKES Wira Medika Bali, Denpasar, Bali, Indonesia
[2] RSUP Prof. dr.I.G.N.G Ngoerah, Denpasar, Bali, Indonesia
[3] Department of Nursing, STIKES Widya Dharma Husada, Tangerang, Banten, Indonesia
[4] Department of Nursing, STIKES Kesdam IV/Udayana, Denpasar, Bali, Indonesia
[5] Department of Nursing, Akper YKY Yogyakarta, Yogyakarta, Indonesia
[6] Faculty of Nursing, Chulalongkorn University, Bangkok, Thailand

[a] Email address: ners.pita@gmail.com
[b] Email address: trilestari100@gmail.com
[c] Email address: diahpusparinipendet@gmail.com
[d] Email address: rachmawa84@gmail.com
[e] Email address: juana.masta.90@gmail.com
[f] Email address: elmysubyartien@yahoo.com
[g] Email address: yupin.a@chula.ac.th

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Abstract
One of the indicators of service quality at the hospital is Healthcare-Associated Infections (HAIs) that can be prevented by hand hygiene, which is a procedure for cleaning hands with soap water, or alcohol-based liquids. This study aimed to identify the effect of Infection Prevention and Control (IPC) training on the level of knowledge and compliance of five moments for hand hygiene in nurses at the Dharma Yadnya Hospital in Denpasar. This study used a pre-experimental one-group pre-post test without a control group design. The number of samples was 42 nurses with purposive sampling techniques that met the inclusion and exclusion criteria. The results showed that before training 26 nurses (61.9%) had a good level of knowledge, and after training, 41 nurses (97.6%) had good knowledge. With regard to compliance with five moments for hand hygiene, before training 22 nurses (52.4%) were not compliant, and after training 29 nurses (69%) imperfectly adhered to the procedure. Mandatory training in IPC influences the level of knowledge and adherence to the five moments for hand hygiene among nurses. Suggestions for hospitals to provide continuity of education related to IPC, monitor nurses' compliance behaviors of the five moments for hand hygiene, either by direct observation or electronically, and provide rewards and punishments for behavioral evaluations.

Keywords: Compliance, Hand Hygiene, Hospitals, Knowledge, Nurse.

Corresponding Author:

Ni Made Nopita Wati
Department of Nursing, STIKES Wira Medika Bali, Denpasar, Bali, Indonesia
Email: ners.pita@gmail.com

1. INTRODUCTION

HAIs are infections that occur in patients during treatment in hospitals and other health care facilities where there was no infection, not incubated, in the beginning of the patient treatment, including infections in the hospital but appear after the patient returns home, also infections due to work, hospital staff and health workers related to the process of health services in health care facilities (Kementerian Kesehatan Republik Indonesia, 2017). The most common types of HAIs in health services, especially hospitals, are Ventilator Associated Pneumonia (VAP), Bloodstream Infection (BSI), Urinary Tract Infection due to catheterization (UTI), Surgical Site Infection (SSI) (Centers for Disease Control and Prevention, 2014; Kementerian Kesehatan Republik Indonesia, 2017). The high prevalence of HAIs is a threat to hospital services.

According to the data from the CDC contained in the national and state HAI progress report SIR acute care hospitals data (Centers for Disease Control and Prevention, 2016), it is mentioned that from a total of 53 states in the USA (United Stated America) there was an increase in the number of HAIs within a year in several states, such as the IAD (Blood Flow Infection) rate in Puerto Rico increased 45%, the incidence of UTI (Urinary Tract Infections) in Vermont increased by 60%, the incidence of VAP (Ventilator Associated Pneumonia) in Nevada increased by 30%, the IDO number (Regional Infection Operations) Colon surgery in Alaska increased 335%, the number of MRSA (Multidrug Resistant Staphylococcus Aureus) in Texas 9%. The incidence of HAIs occurs in 15% of all hospitalized patients. HAIs account for around 4-56% of neonatal deaths, with an incidence rate of around 75% in Southeast Asia and Sub-Saharan Africa. The incidence of HAIs in Indonesia is taken from 10 education hospitals that conduct active surveillance obtained a figure of 6-16% with an average of 9.8% (Kementerian Kesehatan Republik Indonesia, 2017). The incidence of HAIs in health workers was found to be more than 8 million exposed to blood or other body fluids. The most frequent contamination pathway is through contact wound types with contaminated sharp instruments such as needle punctures and scalpels (82%), contact with mucous membranes of the eyes, nose and mouth (14%), exposed to peeling or damaged skin (3%) (Centers for Disease Control and Prevention, 2016).

An increase in the incidence of HAIs in a hospital will have an impact on lengthening day care, patient death, the increase of care costs, as well as resulting in poor service quality and hospital image (Stewart et al., 2021). Other impacts are increasing functional helplessness, emotional distress, disability, and decreasing quality of life, even death (Ernawati et al., 2014). As a result of the spread of infection globally will also increase the incidence of MRSA in health facilities and the unavailability of new generation antimicrobials will be a serious problem. Safety for health workers is also a concern to reduce the number of injuries caused by exposure to HAIs, which can affect the quality of health services provided.

HAIs can be prevented if health services are able to implement the IPC program consistently. IPC is an effort to ensure that everyone is protected from the possibility of contracting infection from public sources, and while receiving health services in various health facilities, by breaking the cycle of transmission of the disease including infectious agents, reservoirs, portal of exit, transmission methods, portal of entry, and host vulnerable so that infection can be prevented or stopped (Komite PPI RSUP Sanglah Denpasar, 2019). IPC activity is a standard of service quality and is important for patients, health workers, and visitors from the incidence of infection by taking into account the cost effectiveness (Kementerian Kesehatan Republik Indonesia, 2017).

The implementation of IPC in health service facilities aims to protect patients, health workers, visitors who receive health services and the community in their environment through standard precautions and transmission-based (Kementerian Kesehatan Republik Indonesia,

2017). Hand hygiene is the first point in 11 standard precautionary programs that must be routinely implemented by health workers. WHO sparked a global patient safety challenge, clean care is safe care, that is, formulating innovative strategies for implementing hand hygiene for health workers with five moments for hand hygiene. Hand hygiene is an effort to clean the hands from microorganisms with soap and water wash (hand wash) and hand rubs alcohol-based liquid antiseptic, by way of six steps and carried out in accordance with five moments for hand hygiene, namely, before contact with the patient, before the aseptic action, after contact with the patient, after contact with the patient's body fluids, and after contact with the patient's environment (World Health Organization, 2009).

Nurses as health workers with a longer intensity accompanying patients in providing nursing care, are required to have good knowledge, skills and attitudes while caring for patients. Nurse compliance in doing hand hygiene is one of the keys to success in preventing HAIs. The results of the nurses' compliance study conducted hand hygiene at Graha Husada Hospital in Bandar Lampung from 47 respondents, 38.3% were compliant with six steps of five moments for hand hygiene and 61.7% were not compliant (Hermawan et al., 2018). Other research conducted at the Dr. Soepraoen Malang of 51 nurses to obtain data of five moments for hand hygiene. For the moment 1 before contact with patients, mostly the nurses did not do hand hygiene for 362 times (82.27%), for moment 2 before the aseptic action, the nurses did not do hand hygiene for 379 times (86.14%), for moment 3 after contact with the patient's body fluids, most of them did hand hygiene for 276 times (72.33%), while for moments 4 and 5 all had hand hygiene for 440 times (100%) (Nurmayunita & Hastuti, 2017). This study aims to identify the effect of the IPC mandatory training on the level of knowledge and compliance of five moments for hand hygiene in nurses.

2. RESEARCH METHOD

This study uses a quantitative approach with a pre-experimental one group pre-post test design without control group design. The study was conducted at the Private Hospital held on September 14-October 31, 2019. This study uses two variables, namely independent variables namely compulsory training on IPC, the dependent variable is the level of knowledge and compliance of five moments for hand hygiene to nurses.

The population used in this study were all nurses of RSU Dharma Yadnya, as many as 68 people, with purposive sampling techniques that met the inclusion and exclusion criteria set by the researchers. Inclusion criteria were practical nurses in the Ayodya Room, Bharata Room, ICU (Intensive Care Unit), Hemodialysis Room, and Emergency Room Installation (IGD), and willing to act as respondents by signing informed consent. Exclusion criteria were nurses on leave or illness during the research process, nurses on assignments studying or attending education/training leaving hospital assignments, nurses on structural duty in hospitals, IPCN (Infection Prevention Control Nurse), and IPCLN (Infection Prevention Control Link Nurse). The number of samples that met the inclusion and exclusion criteria was 42 people.

The data collection instrument used was a questionnaire consisting of nurses' characteristics and nurses' knowledge about IPC material adopted from Imallah (2015) in the form of pre and post-test and observation sheets of compliance of five moments for hand hygiene for nurses.

The Principal Investigator (PI) developed Nurses IPC Knowledge Questionnaire in Bahasa. The questionnaire consisted of 20 questions covering the definition and purpose of hand hygiene, techniques and time to clean hands, the reasons why nurses need to wash their hands, and five moments of washing hands. The questionnaire was developed in the form of multiple choice questions with four answer choices. Respondents' answers are adjusted to the answer key, the correct answer will get a value of 1 while the wrong answer is given a value of 0. Total scores on each question will be added up and given a good grade (16-20), enough (12-

15), less (≤ 11). This research has passed the test of validity and reliability. The results of the validity test show the value of r 0.396-0.814 (r table = 0.361) this shows a valid questionnaire shown by r arithmetic> r table. The reliability test results showed Alpha Cronbach value of 0.886.

The observation sheet used to see nurses' compliance in performing the five moments for hand hygiene and the six steps consists of three scores in each moment that will be observed in each nurse for the pre and post IPC training on one occasion. The value of the observation sheet consists of 1) a score of 2 for respondents compliant to do hand hygiene with a technique of 6 perfect steps at each moment, 2) a score of 1 for respondents doing hand hygiene with a technique of 6 steps less than perfect at each moment, 3) A score of 0 for respondents who did not do hand hygiene at each moment. Then each score at each moment will be added up and given a score of perfect obedience (score 10), less than perfect obedience (score 5-9), non-compliance (score 0-4). This research has passed the test of validity and reliability. The results of the validity test show the value of r 0.532-0.943 (r table = 0.361) this shows a valid questionnaire shown by r arithmetic> r table. The reliability test results showed Alpha Cronbach value of 0.968.

The researcher likened the perceptions of the 2 enumerators who helped to observe five moments for hand hygiene in the respondents determined by the researcher, by explaining the observation sheet and how to assess the respondent's compliance according to the researcher's objectives. Then, the researcher takes an informal approach by explaining the purpose and objectives of the study, research procedures, rights and obligations when becoming a respondent, and signing an informed consent, if the respondent is willing. Respondents who have signed an informed consent were observed on September 14-19, 2019 by enumerators and researchers to assess nurses' compliance in carrying out five moments for hand hygiene, six steps at a time.

Respondents were invited back on 20 September 2019 at 12.00 pm (GMT+7) for a pre-test which was divided into two sessions of the total sample. The researcher was assisted by the Hospital IPC team (IPCN) in providing interventions in the form of IPC compulsory training which was divided into two meeting sessions, where each material delivery session was conducted for two hours, and provided training modules to all respondents.

Researchers invited respondents back on October 21, 2019 at 12.00 pm to conduct a post test that was divided into two sessions of total respondents. Respondents were re-observed by enumerators and researchers to assess compliance in carrying out five moments for hand hygiene six steps in one chance on 23 to 31 October 2019.

Researchers re-examined the completeness of the questionnaire filled out by respondents and conducted data processing on the collected questionnaires and checked return the observation sheet data that has been collected. The study includes a univariate analysis of age, sex, education, work experience, knowledge, and compliance. The bivariate analysis employed the non-parametric McNemar test to assess the disparity between the pre- and post-intervention groups.

3. RESULTS AND DISCUSSION

The research was conducted from September to October 2019 with 42 nurses as a sample. The characteristics of nurses are displayed in Table 1, while the research results of the intervention are in Table 2 below.

Table 1. Distribution of respondents.

Variables	**F (n=42)**	**%**
Age		
Late adolescence (17-25 years)	6	14,3

Variables	F (n=42)	%
Early adulthood (26-35 years)	27	64,3
Late adulthood (36-45 years)	7	16,7
Early elderly (46-55 years)	2	4,8
Sex		
Male	13	31,0
Female	29	69,0
Education		
Vocational	33	78,6
Bachelor	9	21,4
Work experience		
1-10 years	32	76,2
11-20 years	5	11,9
21-30 years	5	11,9

Table 1 showed characteristics of respondents based on the age of majority in early adulthood (26-35 years) with 27 respondents (64.3%), the majority were female respondents with 29 respondents (69.0%), the majority were graduates of DIII Nursing with 33 respondents (78.6%), and the majority had worked in the Dharma Yadnya Hospital in Denpasar for 1-10 years, totaling 32 respondents (76.2%).

Table 2. Pre-post intervention analysis (n=42).

Variables	Before		After		p-value
	F	%	F	%	
Level of knowledge					
Low of knowledge	1	2,4	0	0	
Moderate of knowledge	15	35,7	1	2,4	0.000
High of knowledge	26	61,9	41	97,6	
Compliance					
Not compliant	22	52,4	0	0	
Less than compliant	19	45,2	29	69	0.000
Perfectly compliant	1	2,4	13	31	

Table 2 shows the level of knowledge of nurses before being given compulsory training on IPC, namely, those having good knowledge with 26 respondents (61.9%), sufficient knowledge with 15 respondents (35.7%), and 1 respondent (2.4%) with less knowledge. The results of the questionnaire answers were that 32 respondents (76.2%) answered incorrectly on item number 13 regarding the theory of HAIs, and only 10 respondents (23.8%) answered correctly. After receiving 2 hours of required IPC training from the IPC Hospital team, the level of knowledge among nurses increased. There were 41 respondents (97.6%) have good knowledge, and only 1 respondent (2.4%) has sufficient knowledge, meaning that of the 42 respondents who participated in the training, 41 respondents (97.6%) understood well the material provided and were able to answer well 20 questionnaire questions that were distributed 1 month after the training was given.

Each respondent in this study was observed on one occasion an activity that has an indication to perform the six steps hand hygiene based on five moments. The results showed nurses' adherence to five moments for hand hygiene before being given compulsory training on IPC, 22 respondents (52.4%) were not compliant, 19 people (45.2%) were less than compliant, and only 1 respondent (2.4%) were perfectly obedient. Most did not do hand hygiene at the first moment, namely before contact with patients, 24 respondents (57.1%) and only 1 respondent (2.4%) were perfectly obedient.

Nurse compliance with five moments for hand hygiene after IPC compulsory training is 0% not compliant, 29 respondents (69%) are less than compliant, and 13 respondents (31%) are perfectly obedient, there is an increase in nurse compliance compared to before training. All nurses have done five moments for hand hygiene both by hand wash or hand rub techniques, although they are still less than perfect six steps. This is because respondents begin to understand the benefits of preventing germ transmission infections when they are obedient in carrying out five moments for hand hygiene with a perfect 6-step technique.

Analysis on the effect of mandatory IPC training on the level of nurse knowledge and compliance ($p<.05$). There is the influence of mandatory IPC training on the level of nurses' knowledge and compliance in Dharma Yadnya public hospitals Denpasar. Based on the results of the output rank of a total of 42 respondents obtained the mean value of knowledge, 35 respondents showed an increase in knowledge, 7 respondents with no change of knowledge, and no respondent showed a decrease. Meanwhile, 33 people showed an increase in compliance, 3 people did not change, and 6 people showed a decrease.

The distribution of module as a source of reading for nurses is useful for repeating IPC material that has been given so that it is more effective to remember without going through the face-to-face process with IPCN trainers repeatedly. Modules can be duplicated not only for nurses but other health workers so that exposure to IPC material is more effective and efficient. The more information a person receives, the more the knowledge of that person increases, giving rise to the awareness of that person behaving in accordance with the knowledge he/she has. This is in line with Nicen (2018), there were significant differences in knowledge, attitudes, and skills after a bundle care management training using questionnaire instruments, observation sheets, and modules on hospital IPC, with 80 respondents which were divided into 40 respondents in the treatment group and 40 respondents in the control group with a p value<0.005.

According Dewi, (2018) assessed the effectiveness of IPC training on the knowledge of employees of the National Brain Center Hospital (RSP PON) through evaluating the pre and post test results of 30 respondents which obtained 100% of respondents experienced an increase in test results. Person's knowledge is mostly acquired or captured through the five senses, the more senses are used to receive information, the more knowledge obtained will be more and more clear (Best & Cameron, 1986). Human knowledge can be obtained through the eyes and ears, through the process of seeing or listening, and also through the process of experience and learning process, such as training from the hospital as a means of providing information, not only delivered verbally but also by performing a demonstration of the movement to truly understand what is the right flow and movement to carry out the 6 steps of hand hygiene as a basis for applying the five moments for hand hygiene. Knowledge become an important determinants of the nurse hand hygiene (Labrague et al., 2018; Setyorini et al., 2022; White et al., 2015). Nurses' hand hygiene intentions will increase whereby knowledge of these factors increased, included subjective norm and knowledge, group norm, perceived behavioral factor, and risk susceptibility (White et al., 2015).

According Mustariningrum & Koeswo, (2015), there was a significant relationship between the provision of training programs organized by the IPC committee and IPCLN management with the increase in the knowledge, attitudes, and skills of officers in Dr. Iskak Tulungagung Hospital. The training program succeeded in increasing the knowledge of officers. Moreover another study showed structured training program and multimodal intervention could improve hand hygiene compliance (Alp et al., 2011; Laskar et al., 2018; Oh et al., 2012). Training will improve knowledge, perceived hand hygiene practice, good adherence, and easy to perform (Laskar et al., 2018; Oh et al., 2012).

4. CONCLUSION

IPC training on respondents' give positive impact, they increased the level of knowledge and compliance. Increasing the knowledge and compliance of nurse in conducting five moments for hand hygiene in more detail to prevent the transmission of germs from patients to officers and vice versa. There shall be continuous education related to IPC in the form of training, in-house training, and through audio-visual media. Therefore, IPC Committee, namely IPCN and IPCLN, is better monitor the nurse's compliance behavior in five moments for hand hygiene both by direct observation and electronically, give rewards and punishment for behavioral evaluation.

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