Analysis of Factors Affecting the Behaviour of Medical Personnel in Carrying Out Hand Hygiene

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ABSTRACT

Introduction: The activities of health workers in carrying out their profession are very risky for nosocomial infections and very high infectious diseases . The Ministry of Health urges every medical personnel to carry out hand hygiene as an effort to minimize the occurrence of nosocomial infections. The purpose of this study was to determine the factors which affect the behaviour of medical personnel in carrying out hand hygiene protocols. **Methods:** This research was a correlational descriptive research. The population in this study were medical personnel of Kebonsari Public Health Center Surabaya, and the samples were taken using a simple random sampling technique with a total of 63 respondents. The variables in this study were knowledge, attitude, training, commitment, supervision and behaviour. Data collection was carried out using a questionnaire sheet, direct observation and statistical test using a path analysis. **Results:** The results of simultaneous statistical tests upon knowledge, attitude, training, commitment, and supervision showed that those 5 factors had an effect on hand hygiene behaviour with 45.6% coefficient of determination (R2), and the results of a partial statistical test (t test) on knowledge, training, commitment, and supervision showed a significant effect on hand hygiene behavior of < 0.05, while attitudes had no significant effect on hand hygiene behavior of > 0.05. **Conclusion:** Knowledge, training, commitment and supervision affected the behaviour of medical personnel in carrying out hand hygiene. These variables, theoretically, contribute to forming good behaviour.

Keywords: behavioral factors, hand hygiene, medical personnel

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INTRODUCTION

Health Care Associated Infections (HAIs) are infections obtained in hospitals or Public Health Centers (PHCs). These infections can be transmitted through medical personnel, patients, visitors who are a carrier, the situation of the hospital, and the PHCs themselves (Minister of Health, 2017). Healthcare associated infections (HCAIs) are a major source of morbidity and mortality and are the second most prevalent cause of death (Haque, 2020). They can be caused by endogenous (present on the skin, nose, gastrointestinal tract, etc) or exogenous infection agents, with the hands of healthcare profesionals being the most common transmission route (Graveto *et al.*, 2018). PHCs or hospitals can be a source of infection where patients are treated and placed very close to each other in a quiet long period, which may lead to a cross-infection among patients and medical personnel. Sources of infection in form of viruses, bacteria, rickets, protozoa and fungi are biological factors that can cause occupational diseases for medical personnel (Suma'mur, 2014).

The occupational hazards of health personnel include frequent contact with body fluids, contaminated equipment, or direct contact with the patient's body . Thus, the risk of cross-infection and the possibility of contracting with infectious diseases is very high and has potential for medium for transmitting pathogens (Octaviani and Fauzi, 2020). World Health Organization (WHO) estimates that around 2.5% of medical personnel are exposed to HIV exposure and around 40% are exposed to Hepatitis B and Hepatitis C viruses. This is approved by the Center for Disease Control (CDC) which reports that every year there are around 385,000 incidents of blood-contaminated puncture wounds by sharp objects, which indicates that medical personnel are at risk of exposure to blood that may cause infection with HBV (Hepatitis B Virus), HCV, and HIV. In addition, infectious diseases cause 15 million

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deaths per year, of which 95% occur in the nations with developing economy, and these deaths are principally because of acute respiratory infections, diarrheal diseases, measles, AIDS, malaria, and tuberculosis (Haque, 2020).

It is estimated that more than 1.4 million patients globally have HCAI at any given time in both developing and developed countries. This causes a substantial increase in the financial burden on individuals, communities and the public. However, prevention of HCAI can mostly be done through proper infection prevention and control policies and planning.

The Minister of Health (2017) explains the guidelines for Infection Control and Prevention, which also contains the universal precautions where one of the efforts to prevent the transmission of nosocomial infections is to perform hand hygiene. Hand hygiene is the act of cleaning hands using soap under running water (handwash) or using an alcohol-based antiseptic (handrub) which aims to mechanically remove dirt from the skin and reduce microorganisms (World Health Organization, 2009). Research conducted by Rahmawati and Sofiana (2017) explained that the average number of germs before carrying out hand hygiene was 3,788 CFU/cm^2 while the average number of germs after carrying out hand hygiene was 775 CFU/cm^2. This means that carrying out hand hygiene is effective to decrease the number of germs.

The behaviour of medical personnel in carrying out hand hygiene is influenced by predisposing, reinforcing and enabling factors. These factors consist of knowledge, attitudes, training, commitment and supervision. Nurses' knowledge about hand washing affect their hand washing behaviour. Dreidi *et al.* (2016) in their research stated that nurses' knowledge about hand washing was still in moderate category with a percentage of 60%. Furthermore, research conducted by Purnawati, Junaiddin and Mewanglo (2018) concluded that knowledge of the five moments of hand hygiene is a fundamental thing that must be understood by a nurse. With this knowledge, nurses are able to apply the five moments of hand hygiene properly and correctly to prevent nosocomial infections in PHC.

Attitude is one of the forming factors of behaviour. The influence can be positive or negative, and it is known that a person's attitude towards a situation will be described in a form of behaviour displayed (Ferdinah, 2017). Research conducted by Amalia *et al.* (2017) showed a significant correlation between attitudes and hand hygiene compliance, and the negative attitudes by the medical personnel caused poor behaviour in applying hand hygiene.

Training also has an important role in encouraging hand hygiene behaviour. Research conducted by Hammerschmidt and Manser (2019) stated that 77.8% of nurses reported themselves having attended a training course for hand hygiene practices, which was reflected in a higher percentageof good hand washing behaviour (65.4%). Individual commitment is also a factor which affects hand hygiene behaviour on medical personnel. Research conducted by Ratnawati dan Sianturi (2018) stated that only 36% medical personnel carried out hand hygiene in good behaviour. Poor commitment from the institution causes this low percentage on hand hygiene implementation.

The above phenomenon explains that most of the medical personnel have not maximized the implementation of hand hygiene in accordance with standard operating procedures, where both the patients and medical are aware of the risks. Due to the explosive nature of antimicrobial resistence on the health of the world's population, the Secretary-General of the United Nations makes it very clear that the strengthening of infection prevention in health facilities should be done immediately as it is central to minimising disease transmission. To address the unsolved and increasingly global problem of multiresistant pathogens, hand hygiene behaviour is an important topic for study (Tacconelli and Pezzani, 2019).

During the pandemic, medical personnel should be more vigilant to their health and safety aspects. Hence, carrying out hand hygiene properly is pivotal. 8 medical personnel of Kebonsari Public Health Center have been exposed to COVID-19 while providing health services. In addition, the Kebonsari Public Health Center is a place that is at risk of COVID-19 transmission where health workers provide health services to patients who are exposed to COVID-19, provide antigen swab services, and others, so that the transmission of COVID-19 can occur between patients and health workers. Health workers who do not perform hand hygiene in accordance with the SOP are at risk of the transmission of COVID-19. Therefore, the researchers are interested in conducting a study entitled "Analysis of Factors Affecting the Behaviour of Health Workers In in Carrying Out Hand Hygiene".

METHODS

This research was conducted at Kebonsari Public Health Center Surabaya starting from April 12th to May 1st, 2021. This research was a quantitative study using a descriptive correlational research design and cross sectional approach. The population of this study were all medical personnel who worked at Kebonsari Public Health Center Surabaya. Sampling was carried out using a simple random sampling technique with samples of 63 respondents. Data collection instruments used questionnaire sheets and observation sheets. Data were analysed using univariate and bivariate analysis.

Univariate analysis in this study would show the frequency distribution of age, gender, educational background, years of service, knowledge, attitudes, training, commitment, supervision and behaviour. Meanwhile, bivariate analysis was used to determine the correlation between independent variables namely knowledge, attitudes, training, commitment, and supervision and the dependent variable, namely behaviour which was analysed using a statistical test, which was Path Analysis using SPSS software. This research has undergone ethics certification from the Faculty of Dental Medicine of Airlangga University with ethics number 256/HRECC.FODM/V/2021.

RESULTS

Univariate Analysis

Table 1 show that the majority of respondents were in the age of 18-40 years old (early adults) accounting for 54 people (85.7%), and that most of the respondents were females, accounting for 43 people (68.3%).. Moreover, the most common educational background was nursing accounting for 23 people (36.5%) which might happen because every health facility requires the services of a nurses related to their duty to provide care to patients for 24 hours. Furthermore, regarding years of service characteristic, most of the respondents had a work period <6 years accounting for 31 people (49.2%).

Table 2 shows the level of knowledge of respondents regarding the concept of hand hygiene in overcoming nosocomial infections. The majority of respondents' knowledge was included in the less category of 31 people (49.2%). Most health workers have understood the steps of hand hygiene, but most of them still have not understood the principles and moments of hand hygiene and the concept of transmission of nosocomial infections. Table 2 shows that of 63 respondents, most of them were categorized having poor training, accounting for 53 people (84.1%).This might happen because the PHC rarely carried out training related to hand hygiene. However, despite the rare provision of training, training that has been carried out is already in accordance with issues that occur in the health world. Moreover, regarding the commitment to doing work, the majority of respondents had a poor commitment to the implementation of hand hygiene, accounting for 62 people (98.4%).

Table 2 also shows that of 63 respondents, most of them were categorized having poor supervision accounting for 38 people (60.3%). Furthermore, the majority of hand hygiene behaviors applied by respondents were included in poor behaviour, accounting for 53 people (84.1%). Most of them applied hand washing behavior according to SOPs , yet some other respondents consciously

Table 1. Frequency Distribution of Respondents' Characteristics Based on Age, Gender, Educational Background, and Years of Service in 2021 at Kebonsari Public Health Center Surabaya

Respondents' Characteristic	Total (n)	Percentage (%)
Age		
18-40 (Early Adults)	54	85.7
41-60 (Middle Adults)	9	14.3
Gender		
Male	20	31.7
Female	43	68.3
Educational Background		
Nursing	23	36.5
Midwifery	10	15.9
Doctor	7	11.1
Dentistry	2	3.2
Pharmacy	3	4.8
Nutritionist	2	3.2
Health Analyst	2	3.2
Public Health	14	22.2
Years of Service		
< 6 years	31	49.2
6 – 10 years	28	44.4
> 10 years	4	6.4

Table 2. Frequency Distribution of Respondents' Characteristics Based on Knowledge, Attitude, Training, Commitment, Supervision and Behaviour in 2021 at Kebonsari Public Health Center Surabaya

Respondents' Characteristic	Category	N	(%)
Knowledge	Poor	24	38.1
	Less	31	49.2
	Good	8	12.7
Attitude	Poor	40	63.5
	Less	23	36.5
Training	Poor	53	84.1
	Less	10	15.9
Commitment	Poor	62	98.4
	Less	1	1.6
Supervision	Poor	38	60.3
	Less	25	39.7
Behaviour	Poor	53	84.1
	Less	10	15.9

Table 3. Effects of Knowledge (X_1), Attitude (X_2), Training (X_3), Commitment (X_4), Supervision (X_5) on Behavior (Y) simultaneously (F Test or Annova) in 2021 at Kebonsari Public Health Center Surabaya

Variable	R^2	F		Sig
Knowledge (X_1), Attitude (X_2), Training (X_3), Commitment (X_4), Supervision(X_5), Behavior(Y)	0.456	Ftable 2.38	Fcount 7.835	0.00

or unconsciously forgot one stage in doing hand hygiene, and also some others said that using gloves made them unwilling to do hand hygiene because they felt their hand were already clean, thus showing poor hand hygiene behavior.

Bivariate Analysis

Table 3 above shows that there was a coefficient of determination (R^2) of 0.456, which means that 45.6% of the independent variables, namely knowledge, attitude, training, commitment, and supervision had effect on hand hygiene behaviour. The coefficient of determination (R^2) is an indicator used to describe how much variation is described

Table 4. Effects of Knowledge (X_1), Attitude (X_2), Training (X_3), Commitment (X_4), Supervision (X_5) on Behavior (Y) Partially (T test) in 2021 at at Kebonsari Public Health Center Surabaya

Independent Variable	Beta	Behavior (Y)		
		t		Sig
		ttable	tcount	
Knowledge (X_1)	-0.31	2.002	-3.706	0.00
Attitude (X_2)	0.19	2.002	1.953	0.05
Training (X_3)	0.30	2.002	3.352	0.00
Commitment(X_4)	-0.35	2.002	-3.960	0.00
Supervision(X_5)	-0.31	2.002	-3.370	0.00

Tabel 5. Correlation Between Independent Variables Based on Pearson Correlation

Variable	X1	X2	X3	X4	X5
X1	-	0.05	0.02	0.08	0.24
X2	0.05	-	0.33	0.21	0.20
X3	0.02	0.33	-	0.10	0.23
X4	0.08	0.21	0.10	-	0.21
X5	0.24	0.20	0.23	0.21	-

in the model. Based on the F test, the Fcount value was 7.835 and the Ftable value was 2.38. Since 7.835 was greater than 2.38 and sig F (0.00) was less than 0.05, then H_0 was rejected, meaning that there was a linear effect between knowledge, attitude, training, commitment, and supervision on the hand hygiene behaviour with the value of the coefficient of determination (R^2) of 45.6%. This result is in accordance with the Behavioral Theory which states that behavior is influenced by factor of knowledge, attitude, training, commitment and supervision.

Table 4 above shows that knowledge tcount value was 3.706 while the ttable was 2.002. Since tcount was greater than ttable, then H_0 was rejected. This means that knowledge had an effect on hand hygiene behaviour with the standard coefficient (beta) of 0.312. Meanwhile, attitude tcount value was 1.953 while the ttable was 2.002, and since tcount was smaller than ttable,, then H0 was accepted. This means that there was no effect of attitude on hand hygiene behaviour with the standard coefficient (beta) of 0.198. Moreover, training tcount value was 3.352 while the ttable was 2.002. Since tcount was greater than ttable,, then H_0 was rejected. This means that training had an effect on hand hygiene behaviour with the standard coefficient (beta) of 0.305. Commitment tcount value was 3.960 while the ttable

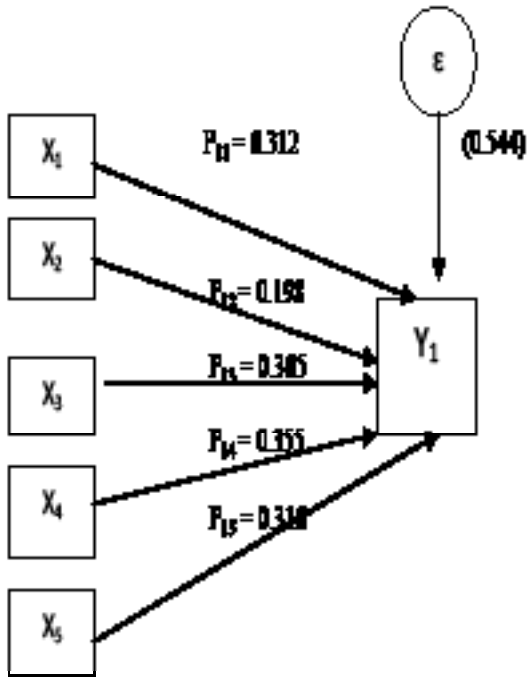

Diagram 1. The Path of Analysis Results

was 2.002. Sincetcount was greater than ttable,, then H_0 was rejected. This means that commitment had an effect on hand hygiene behaviour with the standard coefficient (beta) of 0.355. Furthermore, supervision tcount value was 3.370 while the ttable was 2.002. Since tcount was greater than ttable,, then H_0 was rejected. This means that supervision had an effect on hand hygiene behaviour with the standard coefficient (beta) of 0.310.

Table 5 above shows the correlation between the independent variables. The purpose of this analysis was to determine whether or not there was a reciprocal relationship between variables. Table 5 explains that there was a significant reciprocal relationship between the knowledge variable (X_1) and the training variable (X_3) of 0.02, where alpha was less than 0.05. Meanwhile, the results of the reciprocal relationship of the knowledge variable (X_1) with the attitude variable (X_2) was 0.05, with the commitment variable (X_4) was 0.08 and with the supervision variable (X_5) was 0.24. The results show that there was no significant relationship found.

It was also found that there was no reciprocal relationship of the attitude variable (X_2) with the training variable (X_3) of 0.33, with the commitment variable (X_4) of 0.21 and with the supervision variable (X_5) of 0.20 where alpha was greater than 0.05. Moreover, Table 5 explains that there was no reciprocal relationship of the training variable (X_3) with the commitment variable (X_4) of 0.10 and with the supervision variable (X_5) of 0.23, where alpha was greater than 0.05. Furthermore, there was no reciprocal relationship between the commitment variable (X_4) and the supervision variable (X5) of 0.21, where alpha was greater than 0.05.

Diagram 1 describes the direction of the direct relationship between the independent variables (X) and the dependent variable (Y), which is depicted by arrows. The direction of the arrows describes the value of the determinant coefficient (R^2). The diagram describes the standard error of 0.544, which means that the value was smaller than the average so that the sampel estimator was more accurate. Thus, the structural equation obtained is as follows:

$$Y_1 = 0.312X_1 + 0.198X_2 + 0.305X_3 + 0.355X_4 + 0.310X_5 + \varepsilon$$

DISCUSSION

The Effect of Knowledge on Hand Hygiene Behaviour

The results of the study found that knowledge had an influence on hand hygiene behaviour of medical personnel. Hand hygiene is a simple procedure which is instrumental in reducing hospital acquired infections and cross transmission of pathogens in the hospitals. The present study shows that the majority of the respondents had moderate knowledge on hand hygiene behaviour. The result is in line with research conducted by Dreidi *et al.* (2016)which stated that medical personnel had a moderete level of knowledge about hand hygiene. This research is also supported by a theory which stated that knowledge or cognitive ability is a very important domain in shaping one's actions or behaviour (Nursalam, 2018). Likewise, research conducted by Shinde and Mohite (2014)stated that knowledge about hand hygiene had a positive impact on good behavior.

Several issues can affect the level of hand hygiene compliance. Several studies have indicated that HCWs' knowledge, beliefs and attitudes influence adherence to hand hygiene guidelines. Self-reported factors for poor hand hygiene adherence include: (1) Irritation and dryness of the hands caused by the ingredients or composition of hand washing soap; (2) lack of running water supply and inconvenient hand washing sinks; (3) lack of

soap and tissue; (4) forgetfulness because of being too busy/not having enough time; (5) shortage/ overcrowding; (6) priority on the patient's needs and (7) an act to lower the risk of contracting infection from the patient (McLaws *et al.*, 2015). Other factors that can cause poor hand hygiene behavior based on observations are low awareness of risks during the treatment process for patients, lack of understanding of medical personnel in using hand scoons, which they thought could replace hand washing , and lack of hand hygiene support facilities, and lack of role from existing parties, such as nurse colleagues and leaders in the implementation of hand hygiene.

Notoadmojo (2014) stated that knowledge-based behaviour would last more, and thus medical personnel who had good level of knowledge about hand washing showed good behaviour in washing their hands both at hospital or at PHCs. The wider the insight or knowledge, the better the behaviour formed.

The Effect of Attitude on Hand Hygiene Behaviour

The results of the study found that attitude had no effect on hand hygiene behaviour of medical personnel. This is in line with research conducted by Ratnawati and Sianturi (2018) which stated that attitude had no effect on the implementation of hand hygiene. On the other hand, this study contradicts research conducted by Oh (2019) which shows that attitude had a positive effect on hand hygiene behavior.

According to Notoatmodjo (2014), when the attitude formed is a negative feeling hence the behaviour formed is also bad behaviour. A negative attitude of medical personnel could be caused by lack of motivation. This statement is in accordance with Nursalam (2018) which stated that attitude is a positive or negative feeling or mental state that is always prepared, studied, and regulated through experience, which has a special influence on a person's response to people, objects, and circumstances. The feelings caused can be negative or positive feelings. The more positive a person's attitude is, the better the behaviour will be, and on the other hand the more negative a person's attitude is, the worse the behaviour will be.

According to Rahmawati and Susanti (2018), attitudes are also influenced byculture. Without realizing it, culture has instilled a line of influence on our attitude towards various problems. The same situation is also noticeable in our attitude towards the implementation of hand washing; if hand washing has been carried out as a culture or work pattern, the implementation of hand washing will go well.

The Effect of Training on Hand Hygiene Behaviour

The results of the study found that the health professional' training had a direct impact on the adherence to hand hygiene behavior of medical personnel. In this study, training were claimed to play an important role in improving hand hygiene compliance and servedas a pivotal influencer. The result of this study is in line with research conducted by Anggara, Safitri and Shovie (2019) which stated that there was an effect of training on hand washing behaviour. This study is also in line with research conducted by Graveto *et al.* (2018) which showed an influence between training and hand hygiene behavior. The analyzed study found an urgent need for intervention among health proffesionals in order to change their attitude towards hand hygiene. In this study, the training carried out by Kebonsari Public Health Center was in the form of a workshop on hand hygiene and also the habituation of doing hand hygiene based on SOP before and after changing shifts.

Mangkuprawira (2014) stated that training is a process of teaching knowledge, skills and attitudes so that medical personnel are more skilled and able to carry out their responsibilities better, in accordance with SOP. Hammerschmidt and Manser (2019) stated that all medical personnel expressed their belief that thestandards need to be repeated regularly through staff training as otherwise they will be forgetten. The managers should highlight their long-term task and nurses should apply correct behaviours of ensuring relevant knowledge is acquired. They emphasized that individuals as well as standards need to be discussed collectively. The more frequent the training given to health workers, the stronger the memory about the importance of hand hygiene so that hand hygiene behavior is getting better.

The Effect of Commitment on Hand Hygiene Behaviour

The results of the study found that commitment had an effect on the hand hygiene behavior of medical personnel, meaning that there was a relationship between commitment and hand hygiene behavior. This study is in line with research conducted by Burhanuddin, Zainul and Harlie (2019)

which stated that there was a partially positive and significant influence of organizational commitment on employee performance at Rumah Sakit Islam Banjarmasin (RSIB) accepted. Commitment is a psychological state that characterizes the relationship between employees and the organization or policy and has implications for the individual's decision to remain or leave the organization or policy. In this study, the commitment of medical personnel was in the poor category because the commitment to carry out hand hygiene according to SOPs was often forgotten because of the heavy workload of medical personnel, so hand washing was often neglected.

Medical personnel can have a good commitment if the leader is able to carry out the agreed commitments. Leaders can remind the medical personnel to always be committed to their work, and do work in accordance with standard operating procedures because someone who is responsible for their commitment can realize high performance of the medical personnel. Commitment is the key to the successful implementation of occupational health and safety. According to Bird (1996) in his book "Commitment", commitment is a strong determination to do something, for example doing hand hygiene according to SOPs. Without commitment, well-constructed behavior is meaningless. This is supported by research conducted by Anggraeni and Rahardja (2018) suggesting that organizational commitment affects employee performance. In their research it was found that employees had high organizational commitment, and if they have trust and can accept the goals and value of the organization, they have the desire to strive towards achievement of organizational goals, and have a strong desire to survive as a member of the organization.

The Effect of Supervision on Hand Hygiene Behaviour

The results found that supervision had an effect on hand hygiene behaviour of medical personnel. This study supports previous research which stated that there was a correlation between the supervision of the head of the room and the compliance of nurses in handwashing behaviour (Syamsulastri, 2017). This supervision was carried out to control or supervise the medical personnel in carrying out their work.

Nursalam (2018) stated that supervision is an effort to assist the development and capacity building of the supervised parties so that they can carry out the assigned activities effectively and efficiently. The implementation of supervision is not only in monitoring whether all health workers carry out their duties as well as possible, but also in monitoring whether they comply with intructions or provisions that have been outlined (Harmatiwi, Sumaryani and Maria Rosa, 2017).

In this study, supervision was always carried out by the head of the room when the medical personnel took health actions in the form of hand hygiene before and after taking medical actions. Hand hygiene supervision was also carried out during shift changes, with each medical personnel demonstrating hand hygiene which was supervised by the head of the room. The head of the room also often appointed one of the medical personnel in turn to demonstrate the steps of hand hygiene.

Supervision was also carried out when the medical personnel went to the action room or inpatient room to provide medical treatment. Whether medical personnel continue to carry out hand hygiene in accordance with the SOP or not need to be investigated further. This supervision is useful for optimizing the behaviour of the medical personnel in order to carry out hand hygiene properly according to SOPs. The less optimal the supervision of the head of the room, the more disobedient the medical personnel in washing their hands. Supratman and Sudaryanto (2017) stated that the mentoring aspect in experiential supervision activities was similar to an advisor in solving problems. One of the problems that were often encountered was the low compliance of medical personnel to wash their hands. The supervision activities in the form of the provision of advice and guidance to medical personnel was known to have an essential role in increasing their knowledge and abilities, especially in the prevention of HAIs (Nursalam, 2018).

CONCLUSION

Based on the results of the study, it is indicated that the factors that influence the behavior of health workers in implementing hand hygiene are factors of knowledge, training, commitment and supervision. These factors contribute to shaping hand hygiene behavior. The higher the knowledge and training obtained, the better the behavior formed. Individuals who are committed to maintaining hand hygiene behavior according to procedures will form good behavior. In addition, supervision from superiors contributes to encouraging health workers to be able to carry out hand hygiene according to SOPs.

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