Vol 9 No 2 June 2024

E-ISSN: 2528-410X

RESEARCH ARTICLE

Prevention and Control of Nosocomial Infections Through Implementation of Precaution Standards at Royal Prima Hospital Medan: An Analysis to Determine the Level of Knowledge, Attitudes and Practices of Maintaining Hand Hygiene

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Abstract: Nosocomial infections (Health Care-Associated Infections/HAIs) are infections that occur in sufferers, health workers, and also everyone who comes to the hospital. There are six types of nosocomial infections, namely: HAP/VAP infections, Phlebitis, urinary tract infections (UTI), surgical wound infections, primary bloodstream infections, and decubitus ulcers. Efforts to prevent nosocomial infections are carried out through the Infection Prevention and Control (IPC) program by implementing Standard Precautions in health facilities, including hospitals. One of the implementations of standard precautions is maintaining hand hygiene. This research is a type of quantitative research with a case-control design conducted at the Royal Prima Medan Hospital on IPC officers with a sample size of 50 respondents who used a questionnaire as a research instrument consisting of three types, namely: Knowledge, Attitude, and Practice adapted from the WHO Hand Hygiene Knowledge Questionnaire for Health Care Workers. Validity tests and reliability tests on the three types of questionnaires show that all questions are valid and reliable. The analysis carried out in this research included three forms, namely: univariate, bivariate and multivariate analysis, using the IBM SPSS version 29 program.

Keywords: Nosocomial Infections, IPC, Precaution Standards, Hand Hygiene, Hospitals

E-ISSN: 2528-410X

INTRODUCTION

Patient safety is one of the main indicators in measuring the quality of health services in hospitals, and one of the important points is the level of nosocomial infections. The impact that can occur if you do not prevent infection properly in the hospital is the emergence of nosocomial infections.

The Indonesian Hospital Association (Persi) defines nosocomial infections or Health Care-Associated Infections (HAIs) as infections associated with health services which are a serious problem for all health service facilities throughout the world, including in Indonesia.[1] If the incidence of nosocomial infections is high, this can affect the image of hospital services.[2]

Data from the World Health Organization (WHO) in 2021 stated that 8.7% of 55 hospitals in 14 countries representing 4 (four) regions of Europe, the Middle East, Southeast Asia and the West Pacific, showed nosocomial infections and 10% of Southeast Asia. More than 4 to 4.5 million patients in Europe every year experience the prevalence of nosocomial infections, whereas, in the United States, at least 5% of the 40 million patients treated every year are due to nosocomial infections with a mortality rate of up to 1% and a treatment cost burden of up to 4.5 billion rupiah per year. The prevalence of HAIs infection in patients in developed countries varies, namely between 3.5% and 12%, while in developing countries, including Indonesia, the prevalence of HAIs infection is 9.1%, with variations of 6.1% - 16%.[3]

In 2015, the Ministry of Health said that the Infection Prevention and Control (IPC) program was very important to implement in hospitals and other health service facilities because hospitals and health facilities are places of health services, as well as being benchmark in assessing the quality of services. The IPC program is also carried out to protect patients, staff, visitors and families from the risk of contracting infections due to being treated, on duty and visiting a hospital or health service facility.

Infection Prevention and Control (IPC) is something that must be considered because infections have a significant impact on health, especially in vulnerable groups such as children, the elderly, individuals with compromised immune systems, and those who are recovering. According to Gary D. Hammer (2018) in Pathophysiology of Disease, the process of infectious disease involves complex interactions between humans as hosts, infectious agents, and the external environment.[4] IPC is also an effort to ensure protection for everyone against the possibility of contracting infections from sources in the general public and while receiving health services at various health facilities.[5]

Healthcare-associated infections (HAIs) are an important problem that requires serious attention worldwide. HAIs refer to a group of infections that the patient did not have before hospital admission. HAIs are not even present in the latency

E-ISSN: 2528-410X

period; this occurs on arrival at the hospital or within 48-72 hours after admission to the hospital.[6]

The Centers for Disease Control and Prevention (CDC) in the United States identifies nearly 1.7 million hospitalized patients each year contracting HAIs while hospitalized for other health problems with more than 98,000 patients (one in 17 patients) dying as a result nosocomial infections. Janine Benyus notes that HAIs have now killed around 100,000 people, or more than HIV/AIDS, cancer or traffic accidents.[7]

Efforts that can be made to prevent and control nosocomial infections from patients, clients and visitors to health workers or vice versa are by implementing Standard Precautions and Transmission-based Precautions in hospitals. Standard Precautions and Transmission-based Precautions are in addition to the 2 previously used methods of infection prevention and control in hospitals, namely Universal Precautions and Body Substance Isolation. Standard Precautions and Precautions based on Transmission are a necessity in preventing diseases transmitted through air, droplets and body contact.

CDC (Central Disease Control) and HICPAC (Hospital Infection Control Practices Advisory Committee) in 2007 recommended 11 (eleven) main components that must be implemented and adhered to in Standard Precautions, namely: hand hygiene, Personal Protective Equipment (PPE), decontamination of patient care equipment, environmental health, waste management, linen management, staff health protection, patient placement, respiratory hygiene/coughing and sneezing etiquette, safe injection practices and safe lumbar puncture practices. These eleven standard precautions must be implemented in all healthcare facilities.[8] Of these eleven components, this research will focus on the hand hygiene component as an effort to prevent and control nosocomial infections in hospitals.

Several studies show that simple infection control procedures, such as: cleaning hands with an alcohol-based hand sanitiser can help prevent HAIs and save lives, reduce morbidity, and minimize health care costs. Routine education and training for healthcare workers can help change handwashing practices to prevent the spread of infection. To support this, WHO has issued guidelines to promote handwashing practices among member countries.

Several studies have been carried out to analyse the correlation between hand-washing behaviour and infection prevention and control efforts, including the results of research conducted by Dian Aprilyani (2018) stated that there is a significant relationship between the role of the Infection Prevention Control Nurse (IPCN) in increasing hand washing compliance for patient safety.[9] Apart from that, the research results of Windawati br. Sinulingga and Evelin Malinti (2021) stated

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E-ISSN: 2528-410X

that there is a relationship between hand-washing activities and efforts to reduce the risk of transmission of hospital-acquired pathogens.[10] Likewise, the results of research conducted by Nourmayansa Vidya Anggraini and Serri Hutahaean (2022) stated that there is a relationship between knowledge of hand washing and the correct steps for patients and families to prevent and control infection.[11] Research conducted by Wijayanti Sahril, Andi Mappanganro, and Ernasari (2023) stated that the role of nurses greatly influences the risk of spreading nosocomial infections in hospitals so nurses must adhere to hand hygiene practices.[12]

Based on this background, the author is interested in researching "Prevention and Control of Nosocomial Infections through the Implementation of Precaution Standards at the Royal Prima Medan Hospital". This aims to determine the relationship and influence between standard precautions, especially hand hygiene components, on efforts to prevent and control nosocomial infections at the Royal Prima Hospital in Medan.

METHODS

This research uses a quantitative research method with a case-control design which uses 3 types of questionnaires as data collection tools, namely: Knowledge, Attitude and Practice questionnaires, using the IBM SPSS version 29 application as a tool for data processing. This research model was adapted from research conducted by ASM Anwarul Kabir, Farjana Akhter, Mahbuba Sharmin, Khaleda Akhter, Mosammat Beauty Begum, Arup Kumar Saha, and Imtiaz Ahmed (2018),[13] where the questionnaire to be used is sourced from the WHO Hand Hygiene Knowledge Questionnaire guide for Health Care Workers.

RESULT

Royal Prima Medan Hospital is a class B private hospital in Medan City which was established in 2014 with the focus of the IPC Committee at Royal Prima Medan Hospital, namely: Bloodstream Infections (IAD), Urinary Tract Infections (UTI), Ventilator Associated Pneumonia (VAP), Surgical Site Infection (SSI), Infusion Wound Infection (Phlebitis). According to the Medan Royal Prima Hospital Data Analysis Report for October 2023 to March 2024, Phlebitis is an infection that always appears with an achievement level exceeding the established standards (above ≤ 1‰).

The results of the validity test using Point Biserial Correlation on the Knowledge questionnaire show that all questions presented in the Knowledge questionnaire are considered valid. Likewise, when tested with Pearson Correlation it is also considered valid. Decision-making based on sig value. (2-tailed) with a probability of 0.01 correlation of all questions about Knowledge with Total_Score smaller than 0.01 and Pearson Correlation for all questions is positive and

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greater than r table 0.368, then 20 questions about Knowledge considered valid.

The results of the validity test using Pearson Product Moment SPSS version 29 on the Attitude questionnaire with df=N-2, 0.01, it was found that each point of the Attitude statement was considered valid because the calculated r result was greater than the r table (0.368). Decision-making based on sig value. (2-tailed) with a probability of 0.01, the correlation of all statements about Attitude with Summary is smaller than 0.01 and the Pearson Correlation for all questions is positive and greater than r table 0.368, then 10 statements about Attitude considered valid.

The results of the validity test on the Practice questionnaire with df=N-2, 0.01, showed that each point of the Practice statement was considered valid because the calculated r result was greater than the r table (0.368). Decision-making based on sig value. (2-tailed) with a probability of 0.01, the correlation of all statements about Practice with Summary is smaller than 0.01 and the Pearson Correlation for all questions is positive and greater than r table 0.368, then 15 statements about Practice considered valid (Table 1).

The results of the reliability test using Cronbach's Alpha SPSS version 29 on the Knowledge questionnaire show that all questions presented in the Knowledge questionnaire are considered reliable or consistent with a value of 0.955 (> 0.60) with a very strong R-value interpretation. The Attitude Questionnaire shows the results that all the questions presented in the Attitude questionnaire are considered reliable or consistent with a value of 0.924 (> 0.60) with the interpretation of the r value being very strong. The Practice questionnaire shows the results that all the questions presented in the Practice questionnaire are considered reliable or consistent with a value of 0.884 (> 0.60) (Table 2).

DISCUSSION

The data analysis used in this research consists of 3 types, namely: univariate, bivariate, and multivariate with 2 types of variables, namely: the independent variable consisting of the Length of Work variable and the Age variable, as well as the dependent variable consisting of Knowledge, Attitude and Practice. Univariate analysis was carried out to obtain a descriptive picture of each variable used in the research, by looking at the frequency distribution in tabular form.[14]

Bivariate analysis is carried out by carrying out statistical tests to determine the relationship between the dependent variable and the independent variable in the form of cross-tabulation (crosstab) with the Chi-Square Test method using the IBM SPSS version 29 program. Multivariate analysis is carried out to determine the linear relationship between two or more variables, that is one variable acts as a dependent variable which is usually symbolized by the notation "Y", while the other variable acts as a free variable (independent) which is

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symbolized by the notation "X".[15] The relationship between these variables is functional, which is realized in a mathematical model. Apart from that, regression analysis is also used to understand variables related to related variables to better understand the forms of these relationships.

The characteristics of respondents in this study include Age, Gender, Education Level, and Length of Work. From the characteristics of respondents based on Age, a description was obtained that the highest age frequency distribution of the 50 respondents at Royal Prima Medan Hospital was 35 years old, namely, 2 respondents (4.0%) and the lowest age was 21 years old with 3 respondents (6.0%). The largest number of respondents were aged 24 years, namely 10 people (10%), and the smallest respondents were aged 22 years, 32 years and 33 years with 1 person each.

From the characteristics of respondents based on gender, a description was obtained that the frequency distribution of respondents' gender from 50 respondents at Royal Prima Medan Hospital consisted of 14 respondents (28.0%) male and 36 respondents (72.0%) female.

From the characteristics of respondents based on education level, a description was obtained that the highest formal education of the 50 respondents at the Royal Prima Medan Hospital was the profession of a nurse and the lowest was a Diploma III (D-3) education. The distribution of nurses at a professional level was 14 respondents (28.0%) and the lowest level of education (D-3) was 25 respondents (50.0%). In addition, 11 respondents (22.0%) had a bachelor's degree in nursing. From the characteristics of respondents based on Length of Work, a description was obtained that the highest distribution of respondents' Length of Work at Royal Prima Medan Hospital was 108 - 120 months (9-10 years), namely, 4 respondents (8.0%) and the lowest is 2 months as many as 1 respondent (2.0%). Of the 50 respondents, the longest working period was 12 months (1 year) with 11 respondents (22.0%) (Table 3).

From the Knowledge variable, the description obtained is that the question that received the correct answer with the greatest frequency was question number 12 which was answered by 44 respondents (88.0%) and the question that received the correct answer with the smallest frequency was question number 2 which was answered by 31 respondents. (62.0%). Respondents who knew the "very good" category in maintaining hand hygiene were 29 respondents or 58% of the 50 respondents. And respondents who knew the "very low" category were 7 respondents or 14%. This means, that of the 50 respondents who answered the Knowledge questionnaire, more had very good skills regarding knowledge of maintaining hand hygiene.

From the Attitude variable, a description was obtained that the statement most frequently chosen with the option

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"agree" (S) out of 50 respondents was the 4th statement (statement 4) with a total of 31 choices or the 50 respondents most chose the agree option from the statement that doing hand hygiene just because you want to do it. If you don't want to, then the respondent doesn't do it. The statement with the fewest choices of "strongly disagree" (STS) was the 10th statement (statement 10) which was chosen by 1 choice (0.02) or out of 50 respondents only chose 1 choice, strongly disagree with the statement that they always implement hand hygiene by WHO steps. Of the 5 answer choices for 10 answers to the Attitude statement given to 50 respondents in the questionnaire, the most choice was "agreed" (S) with a total of 231 choices (0.462). And the fewest choices are "strongly disagree" (STS) with a total of 11 choices (0.022). Respondents who filled out the Attitude questionnaire in the "very good" category in maintaining hand hygiene were 16 respondents or 32% of the 50 respondents. And there were no respondents in the "very low" category. However, of all respondents, the majority were in the "good" category with 26 respondents (52%) in Attitude towards maintaining hand hygiene.

From the Practice variable, the description obtained is that the statement most frequently chosen with the option "strongly agree" (SS) from 50 respondents is the 1st statement (statement 1) with a total of 41 choices or the 50 respondents who chose the most strongly agree option from the statement that the duties of health workers at Royal Prima Medan Hospital are following Standard Operational Procedures. Of the 5 answer choices for 15 answers to the Practice statement given to 50 respondents in the questionnaire, the most choice was "agreed" (S) with a total of 395 choices (53%). And the fewest choices are "strongly disagree" (STS) with a total of 2 choices (0.0027). Respondents who filled out the Practice questionnaire in the "very good" category in maintaining hand hygiene were 29 respondents or 58% of the 50 respondents. And there were no respondents in the "very low" category.

Bivariate analysis in this research was carried out by testing the hypothesis of whether or not there was a correlation between the independent variable and the dependent variable using the Chi-Square test method. From the analysis carried out, it is known that there is no correlation between Gender, Age, Length of Work and Knowledge, Attitude and Practice. Likewise, there is no correlation between Education Level and Knowledge and Attitude. However, there is a correlation between Education Level and Practice.

Bivariate correlation testing the probability value (p-value) between the independent variable and the dependent variable, it was concluded that Ho was accepted, which means there is no significant relationship between gender and nurses' knowledge in preventing and controlling nosocomial infections at the Royal Prima Hospital. Medan. Only the bivariate correlation between the

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independent variable level of education and the dependent variable Practice has a H_o conclusion that is rejected, which means there is a significant relationship between the level of education and the Practice of nurses in preventing and controlling nosocomial infections at the Royal Prima Hospital in Medan (Table 4).

Multivariate analysis of independent variables (Age and Length of Work) and dependent variables (Knowledge, Attitude and Practice) were analysed using the IBM SPSS version 29 program through 2 forms of testing, namely: classical assumption testing, which includes multicollinearity test, autocorrelation test, test heteroscedasticity, normality test, and linearity test. From testing the classical assumptions on the independent and dependent variables, it can be concluded that they are free from multicollinearity, have no autocorrelation problems, are free from heteroscedasticity, and are normally distributed so that they meet the requirements of the classical assumption test for linear regression (Table 5).

The second form of testing is the model feasibility test, which includes: the model reliability test (F test), regression coefficient test (t test), and coefficient of determination test. From the requirements fulfilment test, it is known that the independent variables Length of Work and Age and the dependent variables Knowledge, Attitude and Practice are free from multicollinearity, there are no autocorrelation problems, free from heteroscedasticity, and the residual data is normally distributed. So that it meets the requirements of the classical assumption test for linear regression. Testing the feasibility of the model in the F test showed that there was no simultaneous influence between the independent variables Length of Work and Age and the dependent variables Knowledge, Attitude and Practice.

From the feasibility test of the model in the t-test between the independent variables Length of Work and Age and the dependent variables Knowledge, Attitude and Practice, it is known that there is no effect of Length of Work on Knowledge, Attitude, and Practice. Likewise, there is no influence of Age on Attitude and Practice, but it does influence Knowledge. From the model feasibility test in the coefficient of determination test, it is known that the proportion of influence of Length of Work and Age on Knowledge is 10.6%, Attitude is 6.3%, and Practice is 8.9% (Table 6).

CONCLUSION

Hospitals are faced with increasingly greater challenges and are required to be able to provide quality, accountable and transparent health services to the public, especially providing patient safety guarantees. Nosocomial infections are one of the important points in measuring the quality of health services in hospitals and patient safety. It is very important to implement an Infection Prevention and Control Program (IPC) in hospitals and healthcare facilities to protect patients,

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staff, visitors and families from the risk of contracting nosocomial infections. As an effort to prevent and control infection, maintaining hand hygiene is an important component implemented in hospitals and other health facilities.

This research concludes that the Level of Education has a positive correlation with the practice of maintaining hand hygiene. In addition, the factors of Length of Work and Age contribute to Knowledge, Attitudes and Practices in preventing and controlling nosocomial infections at the Royal Prima Medan Hospital. From the results of this research analysis, the author suggests that IPC officers have a minimum educational qualification of Bachelor's Degree/Ners, are at least 25 years old, and have experience in the IPC field for at least 2 years.

ACKNOWLEDGMENTS

The author would like to thank Prof. Dr. Chrismis Novalinda Ginting, M. Kes., AIFO as Supervisor I and Dr. dr. Sri Wahyuni Nasution, MKT., MKM., as Supervisor II, who provided guidance during the research process carried out at the Royal Prima Medan Hospital and also provided knowledge while the author was studying for a Master's in Public Health at Prima Indonesia University. We hope that the results of this research will be useful for developing knowledge in the field of infection prevention and control, both at Prima Indonesia University and at Royal Prima Medan Hospital.

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ATTACHMENT

Table 1. Validity Test Results of Knowledge, Attitudes and Practices Questionnaire

No.	Type of Questionnaire	df (N-2, 0,01) / r table	Number of Questions	Pearson Correlation	Sig. (2-tailed) p = 0,01	Validity
1.	Knowledge	0,368	20	r result > r table	Total Score < 0,01	Valid
2.	Attitude	0,368	10	r result > r table	Summary < 0,01	Valid
3.	Practice	0,368	15	r result > r table	Summary < 0,01	Valid

Table 2. Reliability Test Results of Knowledge, Attitudes and Practices Questionnaire

No.	Type of Questionnaire	Cronbach's Alpha	Number of Questions	Reliability	r table (N=50, sig. 0,01)	Questionnaire Reliability
1.	Knowledge	0,955	20	0,955 > 0,60	0,361	Reliable
2.	Attitude	0,924	10	0,924 > 0,60	0,361	Reliable
3.	Practice	0,884	15	0,884 > 0,60	0,361	Reliable

Table 3. Frequency Distribution of Respondent Characteristics Based on Age, Gender, Education Level, and Years of Work

No.	Characteristics of Respondent	Frequency Distribution
1.	Age	The highest age was 35 years with 2 respondents (4.0%) and the lowest age was 21 years with 3 respondents (6.0%). The largest number of respondents were aged 24 years, namely 10 people (20%), and the smallest respondents were aged 22 years, 32 years and 33 years with 1 person each.
2.	Gender	There were 14 respondents (28.0%) male and 36 respondents (72.0%) female.
3.	Education Level	The distribution of nurses at the professional level was 14 respondents (28.0%) and the D-3 education level was 25 respondents (50.0%).
4.	Length of Work	The longest working period was 108 – 120 months (9 – 10 years), namely, 4 respondents (8.0%) and the least were 2 months, 1 respondent (2.0%). Of the 50 respondents, the longest working period was 12 months (1 year) with 11 respondents (22.0%).

Table 4. Bivariate Correlation

No.	Variable	Asym. Sig. (2-sided)	p-value	df	Chi-Square Tests	Chi-Square Table	Hypothesis	Correlation
1.	Gender and Knowledge	0,653	0,05	17	14,203	27,587	H_o accepted	No
2.	Gender and Attitude	0,452	0,05	22	22,140	33,924	H_o accepted	No
3.	Gender and Practice	0,263	0,05	20	23,545	31,410	H_o accepted	No

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4.	Age and Knowledge	0,970	0,05	221	183,294	256,680	H_o accepted	No
5.	Age and Attitude	0,964	0,05	286	244,532	326,443	H_o accepted	No
6.	Age and Practice	0,858	0,05	260	235,722	298,610	H_o accepted	No
7.	Length of Work and Knowledge	0,837	0,05	289	265,424	329,648	H_o accepted	No
8.	Length of Work and Attitude	0,663	0,05	374	361,975	420,094	H_o accepted	No
9.	Length of Work and Practice	0,450	0,05	340	342,616	383,999	H_o accepted	No
10.	Education Level and Knowledge	0,459	0,05	17	16,933	27,587	H_o accepted	No
11.	Education Level and Attitude	0,139	0,05	22	29,200	33,924	H_o accepted	No
12.	Education Level and Practice	0,025	0,05	20	34,200	31,410	H_o rejected	Yes

Table 5. Multicollinearity Test Results

No.	Variable of Multicollinearity	Eligibility Test								
		Multicollinearity								Conclusion
		Standard Error (< 1)		Standard Beta Coefficient (< 1)		VIF (< 10)		Tolerance (>0,10)		
		X1	X2	X1	X2	X1	X2	X1	X2	
1.	Length of Work (X1), Age (X2), and Knowledge (Y)	0,042	0,366	-0,460	0,527	2,672	2,672	0,374	0,374	Undetectable (free)
2.	Length of Work (X1), Age (X2), and Attitude (Y)	0,051	0,449	-0,340	0,411	2,672	2,672	0,374	0,374	Undetectable (free)
3.	Length of Work (X1), Age (X2), and Practice (Y)	0,047	0,413	-0,237	0,448	2,672	2,672	0,374	0,374	Undetectable (free)

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Table 6. Autocorrelation Test Results

No.	Multivariate Correlation	Eligibility Test							
		Autocorrelation							Conclusion
		n	Var. X (k)	DW table (k=2; n=50) α = 0,05		DW result	Positive Autocorrelation Detection (DW<dL)	Negative Autocorrelation Detection (4-DW>dU)	
				dL	dU				
1.	Length of Work (X1), Age (X2), and Knowledge (Y)	50	2	1,4625	1,6283	0,962	Positive Autocorrelation	There is no negative autocorrelation	There is no autocorrelation problem
2.	Length of Work (X1), Age (X2), and Attitude (Y)	50	2	1,4625	1,6283	1,790	There is no Positive Autocorrelation	There is no negative autocorrelation	There is no autocorrelation problem
3.	Length of Work (X1), Age (X2), and Practice (Y)	50	2	1,4625	1,6283	1,658	There is no Positive Autocorrelation	There is no negative autocorrelation	There is no autocorrelation problem

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