

Monitoring and Evaluation of the Use of Personal Protective Equipment (Ppe) Among Nurses in Post Pandemic Educational Hospitals

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ABSTRACT

Use personal protective equipment (PPE) to prevent the chain of disease transmission, especially Covid-19. This study aims to monitor and evaluate the use of PPE among nurses who work in inpatient and emergency rooms at teaching hospitals in Malang. This research uses a cross-sectional comparative analysis approach. Data were collected using hospital SOP observation sheets by the Minister of Health Regulation 27 of 2017. Using a purposive sampling technique, the sample size was 82 nurses, divided into inpatient and emergency rooms. Data analysis uses descriptive and Chi-square to analyze differences in work area use of PPE ($\alpha= 0.05$). The study's results showed differences in compliance and level of risk of exposure for nurses in using PPE in emergency departments and inpatient rooms (p -value=0.009). Emergency department nurses use PPE more often according to SOP, which has a higher exposure risk than inpatient nurses.

INTRODUCTION

The Indonesian government has implemented an emergency response policy to handle COVID-19 since early March 2020, including implementing local large-scale social restrictions (PSBB) policies (Oktari et al., 2021). The government is implementing the new normal to reduce the number of COVID-19 transmissions while maintaining community productivity and complying with health protocols. In the new average era, positive cases of Covid-19 increased again, reaching 4,205. PPE is one way to prevent and break the chain of transmission of COVID-19 and is personal protection for health workers, especially nurses, who provide health services to patients (Fatmawati et al., 2021). Michel-Kabamba et al., (2021); El-Sokkary et al., (2021) low number of health workers using PPE during patient contact. Lack of knowledge and attitude of nurses and lack of availability of PPE are the causes of health workers not complying with using PPE appropriately (Winandar & Muhammad, 2022) improper use of PPE by health workers has the potential to increase transmission and risk of infection, ultimately leading to reduced capacity of health workers and the possibility of increasing death rates (Gordon & Thompson, 2020).

Banjarnahor (2021) shows that nurses who were exposed to COVID-19 came from inpatient rooms (51.6%) compared to nurses who worked in the Emergency Room (6.5%). Few medical personnel died fighting the COVID-19 virus due to lack of compliance, inadequate availability of Personal Protective Equipment (PPE) and errors in use (PPE) during the COVID-19 pandemic (El-Sokkary et al., 2021). Awareness of medical personnel is still deficient in using PPE, where the use of PPE in hospitals in Indonesia only reaches 40%, and evidence in the field shows that, on average, nurses only use one type of PPE when handling patients (gown, handshands, or mask) (Said & Darmawan, 2014). A teaching hospital is a hospital that functions as a place for education, research, and integrated health services in the field of continuous education for multi-health professions, as well as as a role model for the surrounding community and other hospitals. This research aims to compare nurses' compliance with using PPE in emergency and inpatient teaching hospitals in Malang after the pandemic.

LITERATURE REVIEW

Personal Protective Equipment (PPE)

PPE is a unique clothing or equipment that is proper for infection prevention and control strategies that hospitals establish for health workers to protect themselves from infectious agents. The selection of PPE must be based on the principles of avoiding work accidents. Conditions for selecting PPE include (RI Ministry of Health, 2020a): Must be able to protect workers, especially health workers, from exposure to the dangers they face (close contact with patients and splashes of the patient's blood or body fluids); Use tools that are as light as possible, to prevent excessive discomfort; Can be used again (reuse or disposable); Does not cause excessive risk; Not easily broken; By established standards; Does not restrict movement; Maintenance is not complex.

Table 1. Standard Operational Procedures for Using PPE in Teaching Hospitals

Criteria for Use of PPE Based on Exposure Risk	Understanding	PPE used	How to act
Low Risk	Actions that do not cause aerosols, splashes of body fluids, direct and indirect contact, droplets and airborne contaminants and have minimal risk of transmission	Use a surgical mask by carrying out hand hygiene according to 5 moments and 6 steps	<ul style="list-style-type: none"> - Carrying out TTV on patients minimizes the risk of transmission. - Carrying out examinations on patients is not infectious and does not have the potential to cause blood splashes or aerosols.
Medium Risk	Actions that produce minimal splashes, aerosols, contaminants both by direct and indirect contact, droplets or airborne which pose a risk of transmission	Use: <ul style="list-style-type: none"> - Handscoon - Surgical/KN-95 masks - Gown/Score 	<ul style="list-style-type: none"> - Aseptic procedures (inserting an IV, inserting a catheter, NGT, etc.). - Treat wounds - Blood sampling.
High risk	Actions that cause splashes, aerosols and contaminants either through direct or indirect contact, droplets or airborne which can cause transmission.	Use: <ul style="list-style-type: none"> - Headgear - N95 mask/equivalent (in patients with droplet/airborne transmission) - Google/faces hield - Handscoon - Gown - Foot covers/boots 	<ul style="list-style-type: none"> - Caring for patients with contact/droplet/airborne transmission - Activities that generate aerosols (intubation, suction, nebulization, etc.). - Perform surgical procedures - Carry out cleaning in high risk areas (isolation, emergency room, etc.) - Carrying out the post-mortem of the corpse - Instrument documentation - PA examination, microbiology, blood

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- samples and blood components and PCR.
 - Handling infectious waste in waste management
 - Hemodialysis procedure
 - Treatment of COVID-19 isolation room and TB isolation.
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Emergency Room and Inpatient Room.

The emergency room consists of the Emergency Room (IGD), where patients are treated for the first time, the Intensive Care Unit (ICU) and the isolation room. The emergency room handles emergency or critical situations requiring continuous medical records and monitoring using special equipment (Indrawati & Romli, 2018). Meanwhile, the inpatient room is one of the hospital services that implement nursing care and nursing services and continuous treatment for more than 24 hours.

METODOLOGI

This research is a comparative analysis with a cross-sectional approach. Research location at Teaching Hospital - Malang. The instruments used consist of 1). The SOP observation sheet for the use of PPE applied at the hospital is by the 2020 Indonesian Ministry of Health guidelines, with the criteria that if the answer is Yes, it is given a score of 1, and No, it is given a score of 0. Objective Criteria: corresponds to a score of 100%; not appropriate with a score \leq 100; 2). PPE Availability Observation Sheet, with criteria: Available with a score of 9; no value \leq 9 available; 3) Observation Sheet on the Risk Level of Use of PPE: If the use of PPE is appropriate to the risk of exposure, then it is given a score of 1 and if the PPE used is not appropriate to the risk of exposure then it is given a score of 0; exposure criteria: Low Risk, Medium Risk and High Risk. Data collection was carried out in January - February 2023. The statistical test used was Comparative or Chi-Square Homogeneity. Data analysis used the SPSS 24 application. Ethics protects this research from FK UMM No.E5.a?187/KEPK-UMM/IX/2022.

RESEARCH RESULT

This study consisted of 82 nurse participants at a teaching hospital in Malang who worked in the emergency room, 41 nurses (ICU, CVCU and Isolation) and inpatients (41 nurses). The demographics of the participants are presented in Table 2. The majority of participants are classified as adolescents with a bachelor's degree in virginity (84.1%), dominated by female nurses (58.5%). Most of them have work experience of more than five years in their respective areas (67.1%). In all emergency and inpatient rooms, complete PPE is available, and proper use of PPE according to SOP is still below 80% (68.3%), with low exposure risk (50.2%).

Table 2. Frequency Distribution of Respondent Characteristics (N=82)

Characteristics	Frequency	Percentage (%)
Age (Mean, SD)	29.37	0.466
Gender		
Man	34	41.5
Woman	48	58.5
Education		
S1	69	84.1
D3	13	15.9
Work experience		
<5 Years	55	67.1
>5 Years	27	32.9
Workplace		
Emergency	41	50
Inpatient	41	50
Exposure Risk Level		
Low Risk	42	51.2
Medium Risk	22	26.8
High Risk	18	22
PPE Risk Suitability		
In accordance	56	68.3
It is not in accordance with	26	31.7
Availability of PPE		
Emergency departments		
Available	9	100
Not available	0	
Inpatient Room		
Available	9	100
Not available	0	

The frequency of use of PPE is determined according to exposure in each exposed room in the cross table (table 3). The analysis using the Chi-Square homogeneity test found that high - low-risk exposure in the emergency room occupied almost the same position (34.1%, 34.1%, 31.7%). In contrast to the

findings in inpatient settings, most exposures are low-risk (68.3%), and high-risk exposures are in the minority (12.2%).

Cross Table 3. Exposure Risk Level

No	PPE Risk Levels	Room				Amount		P Value
		Emergency		Inpatient		n	%	
		n	%	n	%	n	%	
1	Low Risk	14	34.1	28	68.3	42	51.2	0.009
2	Medium Risk	14	34.1	8	19.5	22	26.8	
3	High Risk	13	31.7	5	12.2	18	22	
	Amount	41	100	41	100	90	100	

Other findings show a significant relationship (p-value 0.009, $\alpha=0.05$) between the differences in using PPE in emergency rooms and inpatient care at teaching hospitals in Malang. The results of the analysis prove that emergency nurses are more disciplined in implementing SOP for the appropriate use of PPE than inpatient nurses.

Table 4. Correlation between suitability of PPE use and work area

No	Work place	Use of PPE		Amount	P Value
		In accordance	It is not in accordance with		
1	Inpatient	22	19	41	0.009
2	Emergency	34	7	41	

DISCUSSION

Research shows that complete PPE equipment is available in all rooms, but not all nurses use the equipment correctly by the applicable SOP. The availability of complete personal protective equipment in the workplace can drive good behaviour change in using PPE through universal precaution procedures (Apriluana et al., 2016). All PPE facilities in the workplace must be appropriate to the risk of exposure in the workplace.

The research results show that the average participant is in early adulthood and should have high enthusiasm and work ethic. Apart from that, it is supported by most of them having a bachelor's degree in nursing. Education is one of the factors that can influence a person to behave better in preventing disease and improving the ability to maintain health by obediently using PPE. Educational background can influence a person's perspective, perception, and attitude when viewing a job or problems. The higher a person's education, the higher their knowledge regarding the benefits of personal protective equipment,

so they will also know about the dangers that arise if they do not comply with using personal protective equipment in the workplace (Notoatmodjo, 2014). But Komalig & Tampai'i (2019) stated that there was no relationship between education and compliance with PPE; this factor could be due to person, behavior and environment.

The difference in the number of gender participants does not influence a person's use of PPE correctly. Apriluana et al., (2016) that both women and men have the same opportunity to implement infection prevention behaviour in health facilities properly. Olum et al., (2020) found no significant relationship between gender and infection prevention behavior. A person's work experience can be a factor in a person's compliance with implementing SOPs. Most have more than five years of experience in their respective rooms. The working period is an individual characteristic that shapes behavior so that they can better understand the workplace conditions and provide awareness to workers to comply, especially in the use of PPE, especially post-pandemic. Workers with more than five years of work experience have better experience than new workers regarding safe procedures at work (Kiswara et al., 2020). However, a nurse with a long service life is not a guarantee that she will comply with infection prevention rules and be skilled at carrying out routine work (Dewi et al., 2022).

Tables 3 and 4 show that the risk of exposure in the emergency area is balanced between low and high risk, where nurses are more disciplined in using PPE according to the SOP. Nurses working in emergency areas are more likely to have initial contact with patients who have infections, be exposed to COVID-19 patients during the pandemic, and potentially become infected. Even though the efforts and services of emergency nurses during the pandemic have been recognized, wearing personal protective equipment to prevent exposure to COVID-19 is good, according to surveys, they are still infected. Most of them know how to use personal protective equipment correctly and generally have a good attitude towards wearing it (Jang & Kim, 2022). Emergency nurses usually wear personal protective equipment longer each day than nurses in other work areas (Hunt et al., 2023).

On the other hand, nurses who work in inpatient settings use more inappropriate PPE. They think that actions carried out in the room have less risk of contracting an infection. In addition, using personal protective equipment for a long time can cause discomfort and fatigue. It can cause headaches, overheating, difficulty speaking, blurred vision, and back pain due to electric-powered air-purifying breathing apparatus (Min et al., 2021). Perceived discomfort from personal protective equipment may hinder healthcare workers' willingness to work during the COVID-19 pandemic, despite research showing a link between inadequate use of PPE and increased risk of COVID-19 infection (Min et al., 2021; Jang & Kim, 2022). Additionally, imitating seniors in taking action is very influential in acting (Min et al., 2021). As a critical person, the senior imitated what the junior did even though the junior knew the action was wrong.

CONCLUSIONS AND RECOMMENDATIONS

Many nurses are still not compliant with using PPE at this time, even though they know the dangers of not using PPE to prevent transmitting infections

after the pandemic. The completeness and availability of PPE equipment in each room do not guarantee that nurses use PPE correctly according to the SOP set by the hospital, even though they work in educational hospitals as role models for surrounding hospitals. Health workers should be encouraged to rationalize the use of PPE by complying with international regulations, best practices, and the latest scientific literature. Supporting an accountable leadership role is critical in ensuring health workers use appropriate PPE in the field. These leaders must collaborate and set an example for health workers using PPE.

The critical role of infection control officers is needed to improve education in the health team. Knowledge about optimal infection prevention and control procedures has yet to be accumulated, so it will be challenging to adapt the recommended PPE devices to protect all modes of transmission, even after the pandemic. Based on our in-depth interview findings, health workers can easily accept PPE recommendations if they are appropriate, easy to understand, consistent, and supported by objective data.

FURTHER STUDY

Our study has limitations because it was an independently administered voluntary survey conducted at a single institution. The results may overrepresent a small fraction of everyday situations and indicate possible selected responses. Although research at one institution has limitations, the results of our study can provide insight into the success of PPE management among health workers. By only including nurses who work in emergency and inpatient areas as research participants, there is a possibility that the results of this study show a biased point of view. While these nurses represent the population's frontline healthcare workers, it is essential to consider the perspectives of medical technicians, infection control teams, and physicians for the future.

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