

**Nurses' Knowledge of CPR as First Responders to the Code Blue System: an Internal Survey at the Manambai Hospital, West Nusa Tenggara Province****Hendri Purwadi¹, Harmili^{1*}, Meri Afridayani²**¹STIKES Griya Husada Sumbawa, NTB, Indonesia²Universitas Samawa, Sumbawa, NTB, Indonesia**Correspondent Author:**

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Email :
harmili9@gmail.com**Keywords :**Cardiac arrest, code blue,
Nurses, CPR, Knowledge.**Abstract**

An in-hospital cardiac arrest (IHCA) is handled by a code blue team. A nurse, then calls the first responder, who discovers a patient having a cardiac arrest must perform CPR while waiting for the code blue team to arrive. Nurses who serve as first responders in Code Blue systems have not been surveyed or studied previously regarding their knowledge of CPR. This study aims to assess the level of knowledge regarding CPR among Nurses as First Responders of the Code Blue system in Manambai Hospital, NTB. The study was a descriptive quantitative with a cross-sectional approach. Eighty-two nurses from the non-critical ward of Manambai Hospital answered questionnaires regarding characteristics and CPR from June to September 2023. The CPR questions consist of eleven multiple-choice choices derived from AHA 2020 guidelines. An analysis of the data was conducted using frequencies and chi-square. A majority of respondents have poor levels of knowledge, accounting for 73.2%, while good levels of knowledge account for only 26.8%. CPR knowledge is associated with CPR experience with a p-value of $p < 0.000$. Knowledge is a major factor in motivating an individual to take action on CPR in code blue system. Survival rates for individuals suffering a cardiac arrest will decrease by 7-10% every minute if CPR is not performed. Hence, courses and simulations are important tools for increasing the level of knowledge and skills of CPR.

INTRODUCTION

Globally, cardiovascular disease and stroke are the two leading causes of death. The prevalence of heart disease continues to rise in the United States, increasing the risk for both out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA) (Virani et al., 2021). A report by the American Heart Association (AHA) (2020) indicates that approximately 350,000 adults suffered out-of-hospital cardiac arrest in the last decade, only 40% received cardiopulmonary resuscitation (CPR) and 12% used an automatic external defibrillator (AED), while 1.2 percent of hospitalized patients suffer an in-hospital cardiac arrest (IHCA), which is projected to increase every year (Merchant et al., 2020). In addition, RISKESDAS (2018) estimates that approximately 1.5% of Indonesians suffer from heart disease and strokes. A cardiac arrest is a condition in which the heart stops beating, resulting in an insufficient supply of blood to the organs, especially the brain (Aitken, Marshall, Chaboyer, & Australian College of Critical Care Nurses, 2015). Studies have shown that survival rates for individuals who have suffered a cardiac arrest will decrease by 7-10% every minute, accordingly, if no immediate action is taken, the patient would die within ten minutes (Cheskes et al., 2015; Stiell et al., 2012). Thus, immediate cardiopulmonary resuscitation (CPR) and early defibrillation are paramount for patients in cardiac arrest to increase the chance of survival (Cheskes et al., 2015; Merchant et al., 2020; Stiell et al., 2012).

A code blue team is responsible for handling in-hospital cardiac arrests (IHCA). In a hospital setting, the use of the code blue indicates that someone is in a life-threatening condition, whether it is a patient, a visitor, a staff member, or a visitor's family member (Monangi, Setlur, Ramanathan, Bhasin, & Dhar, 2018). According to Jackson and Grugan (2015) and the Indonesian standard of Hospital accreditation, the code blue team responds within three to five minutes of being activated. Therefore, a nurse who discovers a patient with a cardiac arrest must perform CPR while waiting for the code blue team to arrive (Jackson & Grugan, 2015). In such situations, nurses must possess excellent CPR skills and be familiar with the code blue procedure in order to increase the chance of survival for patients experiencing cardiac arrest in hospitals.

A number of studies have indicated that Indonesian health care workers are lacking in CPR knowledge. A study conducted in the Emergency department in Banjarmasin found that 43,7% of nurses have a low level of knowledge (Rizani, Kholik, & Permadi, 2018) whereas most nurses at Pelamonia Makassar hospital were only in the average category (Thalib & Aisa, 2020)), and 43,3% of nurses in Cut Meutia hospital Aceh do not have sufficient knowledge (Millizia, Sawitri, & Harahap, 2020). Meanwhile, developed countries such as Italy discovered that 68,3,7% of health care professionals at the Zona Ospedaliero Universitaria Pisana, Pisa, Italy had good BLS knowledge and determined the survival rate (Spinelli, Brogi, Sidoti, Pagnucci, & Forfori, 2021)

This study is essential due to the implementation of a code blue system in the HL Manambai Abdulakdir Hospital, which covers all non-critical areas of the hospital. In contrast, interviews conducted with several code blue teams revealed that nurses in non-critical rooms frequently did not perform high quality CPR and did not initiate code blue when a patient was suspected of having a cardiac arrest. Furthermore, five nurses stated that they did not really understand the Code Blue system among the 10 interviewees. In addition, six nurses reported that they often forgot about the cardiopulmonary resuscitation (CPR) procedure and were unsure whether they had performed high quality CPR. Further, there is no internal survey or previous study focused on the knowledge of CPR among nurses who serve as first responders in Code Blue systems, particularly in Hospital West Nusa Tenggara, Indonesia. As a result, this research will contribute to the improvement of health quality and survival rates for patients at Manambai Hospital, particularly those who are suffering from cardiac arrest. The purpose of this study was to assess the level of knowledge regarding CPR among Nurses as First Responders of the Code Blue system in Manambai Hospital, NTB.

RESEARCH METHODS

This study was a descriptive quantitative with a cross-sectional design to determine the level of CPR knowledge among nurses more closely. The study was conducted from June to september 2023. A total population of Nurses in non-critical ward of Manambai Hospital is 103 nurses. The number of samples was 82 respondents which based on the Slovin technique. A proportional random sampling technique was used to gather data from each ward which consist of medical surgical ward accounted for 68 respondents, pediatric 13 respondent and isolation ward accounted for 15 respondents. All participants met the inclusion and exclusion criteria, including working in a hospital for at least one year. They also had attended previous CPR training, having performed CPR, and being willing to participate as participants in the study and share their knowledge and thoughts. All participants were informed about the study's objectives and procedures. Participants were also informed that they had the right to agree or withdraw at any time during the data collection process. All respondents have read and completed the informed consent form. The study was also approved by the hospital's ethical committee through the letter of permit number 003/1471/RSMA/II/2023.

To collect data from respondents, an internal survey was conducted through questionnaires about characteristics and CPR. The demographic questionnaire contains questions on gender, education, length of employment, nursing roles, and CPR experience. There were eleven multiple choice questions on cardiopulmonary resuscitation derived from the AHA 2020 guidelines. The data were analysed using frequency distributions, which describe the amount and percentage of data. To analyse the relationship between demographic data and CPR knowledge, a bivariate analysis was also conducted, utilizing Chi-square to determine the relationship between each demographic variable and the level of CPR knowledge.

RESULTS

a. Characteristic of respondent

Table 1 shows the characteristics of respondents including gender, education, length of worked, nursing roles and the experienced of CPR. It can be seen from the table that the female is more than male which counted for 58.5 % and 41.5% respectively. Most of the participant was diploma of Nursing (54.9%) meanwhile bachelor nursing counted for 45.1%. Mostly respondent have 3-5 years experienced as nurses which account for 68.3% whereas about 24.4% having more than 5 years experience and only 7.3% respondent have 1-3 years' experience. In terms of nursing roles, about 74.4% of respondents are associate nurses while 25.6 % was team leader. All of participants having experienced of perform CPR. Most of respondents have performed CPR 1 to 5 times within 6 months periode which account for 70.7% while 29.3% have more than 5 times.

Table 1
The Characteristics of Respondents

Characteristics	F	%
Gender		
• Female	48	58.5%
• Male	34	41.5%
Education		
• Diploma	45	54.9%
• Bachelor	37	45.1%
Length of Work		
• 1-3 years	6	7.3%
• 3-5years	56	68.3%
• >5 years	20	24.4%
Nursing Role		
• Team Leader	21	25,6%
• Associate Nurses	61	74.4%
Experience of Perform CPR (3 months)		
• 1-5 times	58	70.7%
• >5 times	24	29.3%

b. level of CPR knowledge

According to AHA guideline, the minimum standard of CPR knowledge and skills is 80% of maximum score. The diagram illustrates the level of CPR knowledge among nurses. It was discovered that most respondents have poor levels of knowledge, which accounts for 73.2 %%, while good levels of knowledge only account for 26.8%.

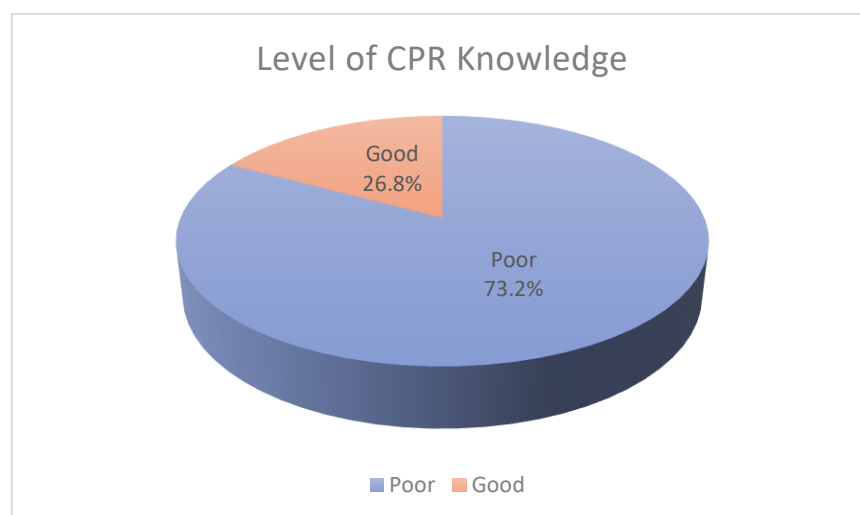


Figure 1
Level of CPR Knowledge

c. Correct answer of CPR questioners

Table 2 shows the correct answers to each question regarding CPR. A majority respondent answered incorrectly for the question relating to performing high quality CPR, which accounted for 73.2%. In addition, 57.4% of respondents have incorrect answer regarding the time for interruption during CPR. On the other hands, a majority of respondents were able to answer the rest of question including correct action taken to unconscious patient, ratio between compression and ventilation, position of hand during perform CPR and the certain circumstance to stop CPR.

Table 2. Correct answer of CPR questions

Questions	F	%
Performing the correct actions on an unconscious patient if you are alone		
• Correct	78	95,2%
• Incorrect	4	4,8%
The correct actions to take when an unconscious patient does not have vital signs until an advanced medical team is arrived	62	75,6%
• Correct	20	24,4%
• Incorrect		
The correct pulse should be used to confirm the presence of an unconscious adult	68	82,9%
• Correct	14	17,1%
• Incorrect		
A manoeuvre to be performed in order to verify the presence of respiratory activity in an unconscious patient	66	80,4%
• Correct	16	19,6%
• Incorrect		

Actions to do by medical staff in case of absence of vital signs

• Correct	72	87,8%
• Incorrect	10	12,2%

The correct ratio between chest compressions and ventilations during CPR in adults

• Correct	77	91,4%
• Incorrect	5	8,6%

The correct position on the chest to place the hand in order to perform CPR

• Correct	58	70,7%
• Incorrect	24	29,3%

Providing high quality CPR in the correct manner

• Correct	22	26,8%
• Incorrect	60	73,2%

Interruptions during CPR at the correct time

• Correct	35	42,6%
• Incorrect	47	57,4%

Performing a recheck of the vital signs is the correct course of action

• Correct	58	70,1%
• Incorrect	24	29,9%

CPR should be stopped in the following circumstances:

• Correct	58	70,7%
• Incorrect	24	29,3%

d. bivariate analysis

The table below shows the bivariate analysis of respondents' characteristics and their level of knowledge of CPR among nurses in the Manambi Hospital.

Table 3. A cross-tabulation of respondents' characteristics and their level of CPR knowledge

characteristics of respondents	Level Of CPR Knowledge		P value
	Poor	Good	
Gender			
- Female	33 (68.8%)	15 (31.3%)	0.207
- Male	27 (79.4%)	7 (20.6%)	
Education			
- Diploma	36 (80%)	9 (20%)	0.099
- Bachelor Nurse	24 (64.9%)	13 (35.1%)	
Length of Work			
- 1-3 years	4 (66.7%)	2 (33.3%)	0.922
- 3-5 years	41 (73.2%)	15 (26.8%)	
- >5 years	15 (75%)	5 (25%)	
Nursing Roles			
- Team Leader	15 (73.8%)	6 (28.6%)	0.522
- Associate Nurse	45 (73.8%)	16 (26.2%)	
Experienced of Performed CPR			0,000

- 1-5 times	51 (87.9%)	7 (12.1%)
- >5 times	9(37.5%)	15 (62.5%)

Table 3 shows that experience performing CPR is associated with knowledge of CPR with a p value of < 0.000%. In other words, the more experience a nurse has performing CPR, the more knowledgeable they are about CPR. In contrast, gender, education, length of working, and nursing roles were not associated with CPR knowledge with p value of >0,05

DISCUSSION

The high mortality rate associated with in-hospital cardiac arrests (IHCA) and inappropriate emergency responses continues to be a global health concern (Spinelli et al., 2021). In accordance with Indonesian Minister of Health Regulation No. 47 of 2018, it is stated that immediate emergency response is necessary to save lives and prevent disability (Ministry of Health, 2022). A code blue team is responsible for administering immediate CPR and defibrillation to cardiac arrest victims. A code blue team consists of doctors and nurses who are trained to provide basic and advanced cardiac life support. In accordance with Indonesian standards for Code Blue, it is mandatory to approach the cardiac arrest patient 5 minutes after the alert has been activated (Jackson & Grugan, 2015; Ministry of Health, 2022). As a result, whoever finds a patient experiencing cardiac arrest for the first time should perform cardiopulmonary resuscitation (CPR) and use an automated external defibrillator (AED).

It was found in this study that most nurses had a poor understanding of CPR. According to the AHA guideline 2020, the minimum standard for correct answers is 80%, and 73.2 % of respondents were unable to correctly answer the CPR questions. As with several previous studies conducted in Indonesia and abroad, this study finds similar findings. A study conducted in Emergency Department in Banjarmasin found that 43.7% of nurses have a low level of knowledge (Rizani et al., 2018), whereas the majority of nurses in Pelamonia Makassar hospital only fall into the average category (Thalib & Aisa, 2020) and 43,3% of nurses in Cut Meutia hospital Aceh have a low level of knowledge (Millizia et al., 2020). Furthermore, according to Andriyani, Setyorini, Dewi, and Pratiwi (2019), 63,3% of respondents in the ICU and emergency unit at the Moewardi Hospital had a poor understanding of CPR. It was found, in similar with this research, that 59% of respondents to a survey of health workers in 25 hospitals in Peru did not pass the CPR test (Aranzábal-Alegría et al., 2017). There was also a study conducted in Tanzania which revealed that the level of knowledge and skill of health workers in Tanzania is mostly in the poor category, despite having received training in CPR (Kaihula, Sawe, Runyon, & Murray, 2018). In addition, another study in Jordan found that respondents who had previously received CPR training scored 4.6 out of 10 on average, which is still in the low category (Oteir, Almhdawi, Kanaan, Alwidyan, & Williams, 2019)

Interestingly, most of the respondents failed to answer fundamental CPR questions such as high quality CPR, length of interruption during compression. Data from the survey indicates that 73.2 % of respondents were unaware of high quality CPR, 57.4% incorrectly answered the length of interruptions, and 29.3.% were unfamiliar of when CPR should be discontinued. The results of this study are consistent with the findings of Spinelli et al. (2021) who found that only 62.3% of the respondents were able to correctly answer the questions about basic life support (BLS). 29.3% of respondents were also unable to correctly answer questions regarding the fundamental aspects of CPR, such as the correct placement of the hands and it was 8.6% of respondents answer incorrectly the ratio between compression and ventilation According to Baldi et al. (2019) only 69.7% of respondents were aware of compression depth, while only 57.8% were aware of compression rate. Furthermore, only 69.7% of respondents knew they had to use an AED, and only 57.2% said they understood the AED. Insufficient knowledge of

CPR is strongly associated with poor CPR skills. Based on the research of Andriyani et al. (2019), better performance of CPR depends on a high level of knowledge. As knowledge is the basis for skills, a good level of knowledge will determine an individual's attitude and abilities. Additionally,

According to bivariate analysis between respondents' characteristics and their level of CPR knowledge, the number of CPR experience was positively correlated with the level of CPR knowledge (p value < 0,000). In contrast, knowledge of CPR was not correlated with gender, education, length of working, and nursing roles. According to Mendhe, Burra, Singh, and Narni (2017) exposure to cardiac arrest is positively related to CPR knowledge. Additionally, Aranzábal-Alegría et al. (2017) found that knowledge of CPR was directly related to the experience of the individual in performing CPR, the more experience they had in performing CPR the greater their knowledge of CPR was. Thus, in order to have a good level of knowledge, nurses should be more experienced in performing CPR. However, in the Manambai hospital, cardiac arrest cases are handled by the code blue team, which decreases the possibility of nurses performing CPR. Nursing as a first responder has only five minutes to perform CPR before the code blue team arrives, causing the nurse to lack practice, which in turn determines the level of competency. Thus, regular training, courses and simulation are one of the solutions are paramount to increase level of knowledge.

CONSLUSION

In-hospital cardiac arrest (IHCA) is one of the most serious health problems seen in hospitals. Even though IHCA is handled by the code blue team, nurses are the first responders who are required to perform CPR before the code blue team approves the patient. Interestingly, nurses at the Manambai hospital are primarily in the poor category when it comes to CPR knowledge. One of the factors that determine a nurse's ability to perform CPR is the amount of experience the nurse has in performing CPR. The more experience the nurse has in performing CPR, the greater their level of knowledge in performing CPR. In order to increase the level of CPR knowledge, training, courses and simulations are paramount. There is also a need for further research to assess the factors that are related to the clinical outcomes of cardiac arrest patients

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