



The Relationship Between Nurses' Knowledge and the Ability to Read ECG to Prevent Cardiac Arrest in the ICU and CCU

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ABSTRACT

ECG is a test performed to monitor the electrical activity of the heart muscle. The heartbeat is normal, slow, fast, or irregular. So, to find out the heart rhythm we must be able to read an ECG (Electrocardiogram). To analyze the Relationship between Nurses' Knowledge and the Ability to Read ECGs to Prevent Cardiac Arrest in the ICU and CCU of Cut Nyak Dhien Hospital. This type of quantitative research uses a cross-sectional study design. The study was conducted from April 25 to 30, 2024. The sampling technique was a total sampling of 38 nurses in the ICU and CCU at Cut Nyak Dhien Hospital. Data collected using a questionnaire and analyzed using the Chi-square test. Knowledge with the ability to read ECGs was mostly in the sufficient category, as many as 17 respondents (44.7%). The results showed a relationship between nurses' knowledge and the ability to read ECGs to prevent cardiac arrest with a p value of $0.000 < 0.05$. It is expected that the hospital can improve nurses' insight and knowledge about ECG through health seminars and special heart training. By increasing nurses' knowledge in reading ECG, the survival rate of heart patients can be increased.

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1. Introduction

Cardiac arrest or commonly called sudden cardiac arrest is a serious heart condition. ECG is a test performed to monitor the electrical activity of the heart muscle. This test will show whether a person's heartbeat rhythm is normal, slow, fast, or irregular. ECG is classified as a non-invasive examination that can visualize the electrical signals of the heart. Therefore, to know the heart rhythm we must be able to read ECG (Belay et al., 2024)

According to the Global Burden of Cardiovascular Diseases incident cardiac arrest is divided into 2, namely Hospitality Cardiac Arrest or HCA, which is cardiac arrest that occurs in a hospital and Out of Hospitality Cardiac Arrest or OHCA, which is cardiac arrest that occurs outside the hospital (Mensah et al., 2023). Cardiac arrest is the number one cause of death in America, where every year around 330,000 people die from cardiac arrest (Nadeemuddin et al., 2023). Data states that more than 17 million people in the world die from heart and blood vessel disease. Deaths in Indonesia due to cardiovascular disease reach 651,481 people per year, consisting of 331,349 stroke deaths, 245,343 coronary heart disease deaths, 50,620 hypertensive heart disease deaths, and other cardiovascular diseases (Kementrian Kesehatan, 2023).

Based on data from the AHA Guideline for the Management of Patients With Chronic Coronary Disease by Virani et al., (2023), cases of death due to heart disease or cardiovascular disease in Indonesia were 251.09 per 100,000 people in 2019. This number increased by 1.25% compared to the previous year which was 247.99 deaths per 100,000 population. Looking at the trend, cases of death due to heart disease in the country continue to increase. In fact, the increase reached 100 deaths per 100,000 population compared to 1990. According to the province, deaths due to heart disease were highest in Yogyakarta in 2019, which was 418.93 per 100,000 population. After that, there was Central Java with cases of death due to heart disease as many as 340.13 per 100,000 population. Cases of death due to heart disease in East Java were 326.97 per 100,000 population. Then, North Sulawesi and West Sumatra have cases of heart deaths per 100,000 population of 320.01 and 267.7 respectively. Deaths from Heart Disease that occur in Aceh are also very high. In fact, Aceh is included in the top 10 regions in Indonesia where the most cases of CHD are found (Kementrian Kesehatan, 2023).

The results of the initial study at Cut Nyak Dhien Hospital, based on data from the Medical Records of Patients with heart disease at Cut Nyak Dhien Hospital, are increasing every year. In 2022, the number of heart patients was 721 people, of which 230 patients experienced cardiac arrest. In 2023, the number of patients with heart disease from January to August was 621 patients, of which 163 cases of cardiac arrest occurred. Meanwhile, in the Intensive Care Units (ICU) and Coronary Care Units (CCU) of Cut Nyak Dhien Hospital, patients with heart disease also increased. In 2022, the number of patients with heart disease was 93 people, in 2023 from January to August there were 136 patients with heart disease.

ECG monitoring is highly recommended in patients who experience chest pain and have cardiac risk factors such as stroke, diabetes, acute renal failure, respiratory dysfunction, trauma, drug overdose, sepsis, shock, older adult patients with risk factors for coronary heart disease (Buluba et al., 2023). Nurses are vital to the delivery of care in hospitals, especially in settings where critical care is needed, such as the patients with these medical conditions are admitted to critical care units namely ICU or CCU (Jalal, 2024). Therefore, it is very important for nurses working in these units to acquire knowledge of basic ECG rhythms for effective patient monitoring and to act accordingly on the information displayed on the cardiac monitor (Duong et al., 2024). However, the cardiac monitors used in most critical care settings display the electrical activity of the heart primarily in lead II, thus, a nurse needs to perform a 12-lead ECG to confirm arrhythmia.

Initial observations in the ICU and CCU of Cut Nyak Dhien Hospital, researchers found 3 incidents where the patient's ECG showed SVT rhythm but the nurse seemed calm. No one contacted the doctor to report the patient's condition. When an emergency occurs, several nurses appear panicked and confused, so that a senior nurse who sees it directly instructs them to contact a doctor and immediately perform CPR. The nurse appears to be giving compressions that are too fast and too strong, so that it is not in accordance with the American Heart Association guidelines. Based on the results of interviews with several nurses, they said that the one who reads the ECG is a doctor so they do not understand the ECG graph or results.

This situation is highlighted by findings indicating that 75% and 65% of nurses had unsatisfactory knowledge in ECG interpretation, respectively. A study conducted in Iraq revealed an overall inadequacy in nurses' knowledge, leading to a subsequent decline in the quality of nursing care and clinical outcomes (Belay et al., 2024). Nurses are usually the first medical professionals to examine ECG readings and identify abnormalities that may require immediate attention. Hence, nurses can be expected to conduct initial assessments, rapidly identify ECG abnormalities, and determine whether to initiate first-line therapies or request emergency medical assistance (Jassim et al., 2023).

Although some hospitals provide training to nurses on ECG monitoring and interpretation, a study revealed that intensive care unit nurses had limited experience with basic ECG interpretation, and there is evidence that negative attitudes about ECG interpretation endure even when study participants had positive attitudes. Additionally, it has been suggested that nurses understand that reading ECGs is a part of their job and not rely just on the counsel and opinions of other medical experts (Nadeemuddin et al., 2023).

According to previous research conducted by Jassim et al., (2023), there was a significant increase in knowledge after being given counseling about ECG. ECG interpretation in triage can be a simple and safe tool that improves the assessment of patient priority (Zaboli et al., 2023). The efforts that have been made by the Hospital are to provide fast treatment to patients. Good handling and skills are carried out by the Hospital's code blue team through training conducted in the hospital itself. The emergency procedure for the code blue team consisting of a doctor and 4 nurses is that when a code blue call is received, they must arrive at the scene within 5 minutes after receiving a code blue call. Based on the phenomena that occurred, the researcher conducted a study entitled "The Relationship between Nurses' Knowledge and the Ability to Read ECG to Prevent Cardiac Arrest in the ICU and CCU of Cut Nyak Dhien Hospital".

2. Methods

This study uses a cross-sectional study design, which is a study to study the relationship between independent variables and dependent variables with measurements once and at the same time (Polit & Beck, 2018). The population in this study were all nurses working in the ICU and Heart ward of Cut Nyak Dhien Meulaboh Hospital, totaling 38 nurses.

The sampling technique used was total sampling where all population units were taken as sample units (Polit & Beck, 2018). So the number of samples in this study was 38 respondents. The research time was carried out on April 25 - April 30, 2024. Data collection used a questionnaire. The analysis used in this study was univariate analysis and bivariate analysis. Univariate analysis is presented in the form of frequency distribution, proportion, diagram, and textual description. This measurement is carried out as basic data for further data measurements, both ordinal data obtained from respondents who have been categorized. In bivariate analysis using the chi-square statistical test.

The researcher used a cross-sectional research design because it is practical, efficient, and suitable for seeing the general picture and relationships between variables. However, its limitation is that it cannot measure the causal relationship accurately due to temporal ambiguity and the presence of confounding factors.

3. Results and Analysis

Table 1
Demographic Characteristics of Nurses in the ICU and CCU (n=38)

Characteristics	Frequency (f)	Percent (%)
Age		
Young Adults (20-30 years)	12	31,6
Middle Adults (31-45 years)	20	52,6
Old Adults (> 46 years)	6	15,8
Gender		
Male	10	26,3
Female	28	73,7
Education		
D3 Nursing	16	42,1
Ners	22	57,9
Total	38	100

The number of respondents involved in this study was 38 respondents. Based on table 1, it states that among the 38 respondents, the characteristics obtained based on age with an age range of 20-30 years (young adults) were 12 respondents (31.6%), an age range of 31-45 years (middle adults) were 20 respondents (52.6%), and respondents with an age range >46 years were 6 respondents (15.8%). Based on gender, the most were women, namely 28 respondents (73.7%) and men as many as 10 respondents (26.3%). Based on education level, the majority were Nurses as many as 22 respondents (57.9%) and the rest were D3 Nursing as many as 16 respondents (42.1%).

Table 2
Distribution of respondents based on knowledge of ICU ECG and CCU (n=38)

Knowledge	Frequency (f)	Percent (%)
Good	12	31,5
Enough	18	47,4
Less	8	21,1
Total	38	100

Based on table 2, it can be seen that the level of respondents' knowledge regarding ECG is fairly good, namely 18 respondents (47.4%), the rest are in the good category, only 12 respondents (31.5%) and there are still 8 respondents (21.1%) who have insufficient knowledge regarding ECG.

Table 3.
Distribution of respondents based on to read ECG by nurses in the ICU and CCU (n=38)

ECG Reading Ability	Frequency (f)	Percent (%)
Good	13	34,2
Enough	17	44,7
Less	8	21,1
Total	38	100

Based on table 3, it can be seen that most of the respondents are not very proficient in reading ECGs, as seen in the research results with the sufficient category of 17 respondents (44.7%), the rest are in the good category of only 13 respondents (34.2%) and there are still those who cannot read ECGs with the poor category of 8 respondents (21.1%).

Table 4
Relationship between Knowledge and ECG Reading Ability of Nurses in the ICU and CCU

Knowledge	Reading Ability ECG						Total		P-value
	Good		Enough		Not Enough		f	%	
	f	%	f	%	f	%	f	%	
Good	12	31,5	0	0	0	0	12	31,5	
Enough	1	2,6	17	44,7	0	0	18	47,4	0,000
Not Enough	0	0	0	0	8	21,1	8	21,1	
Total	13	34,1	17	44,7	8	21,1	38	100	

Table 4 shows that of the 38 respondents studied, it shows that respondents who have knowledge in the good category have good ECG reading skills as many as 12 people (31.5%), while those who have knowledge in the sufficient category have good ECG reading skills only 1 person (2.6%), the majority with sufficient knowledge also have a level of ECG reading skills in the sufficient category, namely 17 people (44.7%) and from this study there are still respondents who lack knowledge about ECG, namely 8 people (21.1%) so that the ability to read ECG is also lacking as evidenced by the results of the study, namely also 8 people (21.1%). The results of the Chi-Square test at a significance level of 95% ($\alpha = 0.05$) show that the P value is 0.000 ($< \alpha$). Therefore, H_a is accepted so that there is a relationship between nurses' knowledge and the ability to read ECG to prevent cardiac arrest in the ICU and Heart rooms of Cut Nyak Dhien Hospital.

Based on data collection that has been carried out from April 25 - April 30, 2024 in the Heart and ICU wards of Cut Nyak Dhien Meulaboh Hospital with 38 respondents. From the results of this study, it was found that there was a relationship between nurses' knowledge and the ability to read

ECGs to prevent cardiac arrest in the ICU and Heart wards of Cut Nyak Dhien Hospital. Cardiac Arrest is a condition where the heart stops working and contracting so that there is not enough blood flow to support the heart muscle and other vital organs. The heart is equipped with an electrical system that functions to generate impulses that cause heart muscle contractions. Cardiac arrest can occur when the heart is not working but there is still an electric current. This can happen due to rhythm disturbances or several other factors (Elias et al., 2022).

Knowledge and ability to read ECGs are mandatory for all nurses, especially nurses who work in intensive care units such as the Heart and ICU wards. ECG is one of the tools used to record the electrical activity of the heart. This tool is useful to help diagnose various heart problems such as cardiac arrest (Belay et al., 2024). Not all patients who experience cardiac arrest will die. The stages of cardiac arrest begin with the death of the heart muscles. Every 4 minutes, parts of the heart muscle in the body will die. The longer the treatment of someone who experiences cardiac arrest, the more heart muscles will die. If someone experiences cardiac arrest but no further medical action is taken, then that person can die (Duong et al., 2024). A person who experiences cardiac arrest, as evidenced by the absence of a carotid pulse, will have their heart rhythm checked through an Electrocardiogram (ECG) (Park et al., 2024). There are two heart rhythm conditions that can be seen from the ECG results, namely (1) asystole rhythm conditions in the form of a flat line or in other words the heart rhythm is flat (not rhythmic) and pulseless electrical activity (PEA) rhythm and (2) rhythm conditions like grass lines (ventricular tachycardia or fibrillation) (Nadeemuddin et al., 2023).

Patients with asystole or PEA heart rhythm conditions, then the patient will undergo Cardiopulmonary Resuscitation, which is a first aid measure for people who have stopped breathing due to certain reasons (Zaboli et al., 2023). What is done is chest wall compression (pumping the heart from the outer wall of the chest), giving breaths either through a breathing aid, giving fluids or medication. The Cardiopulmonary Resuscitation process for patients with flat heart rhythms will be evaluated for 10 to 20 minutes. If there is no change in the patient for more than 30 minutes, then the patient's life expectancy is very small. If the ECG results show a grass-like rhythm (ventricular tachycardia or fibrillation), then the patient will be defibrillated or electrocuted as the main therapy in addition to Cardiopulmonary Resuscitation (CPR) (Liu et al., 2024). With defibrillation, the heart rhythm disturbance that occurs can be restarted. If the rhythm returns to normal, the patient will undergo an examination of the electrical waves in the arteries. So a person can appear as if alive with the presence of these electrical waves even though their heart is not working (Purmah et al., 2021).

This study is in line with which found that there was an effect of ECG counseling on knowledge of ECG interpretation in undergraduate nursing students, meaning that ECG counseling had an effect on increasing knowledge of ECG interpretation. Aruming, Jalal, (2024) study found that the application of the ECG interpretation algorithm could improve the ability and speed of nurses in basic ECG interpretation. According to researchers, nurses' knowledge of the ability to read ECGs is very beneficial in preventing cardiac arrest. If the knowledge and ability to read ECGs are good, the level of cardiac arrest patient safety can increase and cardiac arrest can be prevented. However, the reality in the field that researchers found was that most of the respondents were not very proficient in reading ECGs, as seen in the results of the study with a sufficient category, there were even nurses who still lacked knowledge and ability to read ECGs (Jamsahar et al., 2024). This is one of the triggers for the increasing death of heart patients. This is caused by the nurse's mindset that assumes that the task of reading an ECG is a doctor's and the diagnostic domain is a doctor's, even though nurses also have their own nursing diagnoses (Jassim et al., 2023).

Therefore, nurses are highly required to be able to recognize changes in their patients' heart conditions. Especially patients who are treated in the emergency unit and intensive care unit. Good knowledge of nurses in interpreting ECG results will facilitate monitoring and handling of heart failure events during treatment, so that in emergency situations, fast, appropriate treatment can be given immediately and prevent death (Buluba et al., 2023).

4. Conclusion

Based on the results of research on the Relationship between Nurses' Knowledge and the Ability to Read ECG to Prevent Cardiac Arrest in the ICU and CCU, it was found that the obtained 38 respondents, the majority of whom had a fairly good level of knowledge of ECG, namely 18 respondents (47.4%), the rest were in the good category only 12 respondents (31.5%) and there were still 8 respondents who lacked knowledge of ECG (21.1%). The results of this study were obtained from 38 respondents who had good ECG reading skills, namely 13 respondents (34.2%). The category of sufficient in the ability to read ECG well was only 17 respondents (44.7%) and also not very proficient in reading ECG, namely with the less category as many as 8 respondents (21.1%). The results of the Chi-square test analysis obtained a p-value of 0.000 which means that there is a relationship between nurses' knowledge and the ability to read ECG to prevent cardiac arrest in the ICU and Heart rooms of Cut Nyak Dhien Hospital.

Hospitals are advised to implement a number of measures to enhance nurses' proficiency in reading ECGs, including regular ECG-related training and education, case-based learning, the provision of readily available learning materials, professional mentoring and supervision, the availability of technology and visual aids, the application of standard protocols or guidelines, and the presence of interdisciplinary collaboration. Physicians and nurses must collaborate to interpret ECGs in order to improve patient outcomes. However, our research shows that regular continuing education on ECGs is required to build the relevant knowledge of ICU, CCU, and ED nurses, which would enhance their ECG interpretation abilities and result in effective ECG monitoring during nursing care. As a result, it's critical that nurses get more expertise in ECG interpretation, diagnosis, and management, especially through ongoing education. So the limitation in this study is that further research is needed to prove causality using an experimental research design to be more appropriate because it allows observation of changes in variables over time.

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