

Description of Knowledge and Skill of Nurses to Interpret Basic ECG in The Hospital

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Abstract: Heart disease is the third cause of the death worldwide. The American Heart Association reported that 405.309 Americans died because of cardiovascular disease in 2008, and about 785.000 Americans got coronary attack for the first time every year. Screening for early detection of cardiovascular disease is an appropriate step in reducing mortality. Electrocardiogram (ECG) data are critical in formulating management strategies of patients with heart disease. The purpose of this study was to determine the level of knowledge and skill of nurses to interpreting ECG rhythms. This study used a descriptive method. Data were collected by questionnaire of knowledge and questionnaire of ECG interpretation from 69 ward nurses. Data analysis showed that 76% of nurses had an average level of knowledge on ECG and 24% of them had below that level. Sufficient knowledge of ECG is not supported by the skill to interpret ECG examination. Increasing the knowledge and skill of basic ECG interpretation of ward nurses is important. Improving the knowledge and skill of ward nurses to interpret ECG rhythms could improve the response time to manage patients with cardiovascular disease so that all procedure could be faster, right and accurate.

1 BACKGROUND

Heart disease is a third disease that causes death worldwide. Early detection of heart disease is a right step to decrease that mortality (Fakhriet *et al.*, 2017). Electrocardiogram (ECG) is an essential strategy in the management to determine the next treatment in a patient handling with cardiology diagnosis. It was estimated as the best sign compared to the increase in serum levels (Zimmerman, Beuhler and Kerns, 2012). It is a diagnostic device that is still affordable for society compared to the other high technology device to detect the abnormalities of the heart (Fent *et al.*, 2016). The ability of the nurse in the ECG interpretation was still low. Their ability was only limited to the measurement and quite low in the interpretation (Zhang and Hsu, 2013).

Every year one of six died in the world was caused by cardiovascular disease. The American Heart Association reported that 405.309 Americans were dead due to cardiovascular disease on 2008 and it was estimated that there would be 785.000 Americans got coronary attack for the first time every year, 470.000 got a recurrent attack, and 195.000 got first myocardial infarction without symptoms

(Muhlestein *et al.*, 2015). The cardiovascular disease nowadays has reached the first position of the cause of the death in Indonesia. Around 25% of all the deaths caused by the cardiovascular abnormalities. The result of Riskesdas 2013 showed that the prevalence of several cardiovascular diseases such as hypertension (based on blood pressure measurement), was quite high, which was 31.7%, while heart disease was 7.2% and stroke was 8.3% for every 1000 citizens (Badan Penelitian dan Pengembangan Kesehatan, 2013).

Most of the STEMI death occurred in the first 1-2 hours. There are a lot of obstacles to identifying the initial recognition of STEMI, including the lack of the patient ability to recognize that they get an ischemia or the paramedic ability to detect the myocardial infarct on the ECG result (Muhlestein *et al.*, 2015). Universitas Airlangga Hospital as a health service has 100 visits on the heart case each day or 20% of the total outpatients and has almost 700 regularly patient visits with the main problem on the heart every month.

The nurse has to have 99% ability in detecting the ECG signal when the patient is in the lethal arrhythmia or the other disturbance that threatens

their lives. In contrary, the ability of the nurse in detecting the presence of ischemia or infarct based on the ECG result was below 50% (Zimmerman, Beuhler and Kerns, 2012). There were a lot of efforts performed to improve the nurse ability in the ECG interpretation. In fact, not all of the health service aware of the importance of improving the nurse ability to decrease the mortality level due to the slow handling (Zhang and Hsu, 2013). There were a lot of methods developed to simplify the ECG interpretation, such as the automatic reading machine, mobile ECG, or computerized ECG. But, those methods did not improve the ability of the paramedics in interpreting the ECG (Bojsen *et al.*, 2015).

The benefit of using ECG is diverse, such as identifying the arrhythmia or dysrhythmia, the coronary disease, the cardiomyopathy, the metabolic disease and the side effect of drugs. From all the benefits of ECG aforementioned, its main role is to identify the presence of arrhythmia or dysrhythmia. It means that by only using the morphology of ECG, the diagnosis of the patient could be strengthened. And for the other benefits, it should be supported by the other supporting examination, such as patient clinical condition and so on (Nazmah, 2015). Based on those benefits, nurses, as a health service provider who are always alongside the patient, their ability in observing the ECG morphological change is important to have a fast response time and a good service quality (Nazmah, 2014). The knowledge of the nurse to interpret the ECG could improve the service quality, like on nursing care to the patients or the determination the result criteria on delivering the nursing care (Xue and Farrell, 2014).

Universitas Airlangga Hospital as an educational hospital in which the knowledge development should be equal and optimal was expected on having nurses with a good ability level on interpreting basic ECG. When there is an abnormality found on the ECG result at the care units, the handling response, in this case, could be faster and the service quality could increase.

Based on the explanation mentioned above, this study was aimed to obtain the description of the ability of nurse of Universitas Airlangga Hospital in interpreting the basic ECG.

2 METHODS

This study used a descriptive design, which aims to know description of knowledge and Ability Interpreting The Basic ECG of Nurse. A sampling method used in this study was a total sampling

method. 69 ward nurses already met the inclusion and exclusion criteria that have been set by the researcher. The data collecting instrument used were nurse knowledge level instrument towards ECG and ability and pace of nurse instrument in interpreting the ECG. The instrumen have been tested for validity and reliability with corrected total correlation $> r$ table (0.632), alpha cronbach knowledge = 0.892, and alpha cronbach Ability Interpreting Basic ECG = 0.911). Questionnaire Data is analyzed descriptively. Data is presented in the form of frequency distribution and proportion / percentage.

3 RESULTS

Based the study that has been performed to 69 inpatient nurses of Universitas Airlangga Hospital, it was obtained the demography data distribution as shown in Table 1.

Table 1 Description of demography data of respondent.

No	Characteristics	Frequency (person)	Percentage (%)
1	Age (Years)		
	20 – 25	12	17,4
	26 – 30	43	62,3
	31 – 35	12	17,4
	> 35	2	2,9
2	Gender		
	Male	10	14,5
	Female	59	85,5
3	Working Duration		
	1-3 tahun	48	69,6
	3-5 tahun	17	24,6
	>5 tahun	4	5,8
4	Last Education		
	D3 Nurse	11	15,9
	S1 Ners (Bachelor)	58	84,1
5	Employee Status		
	Hospital		
	Honorary	54	78,3
	Employee		
	University	4	5,8
	Honorary		
	Employee	11	15,9
	Government		
	Employee		

Undergoing the nurse knowledge questionnaire about ECG, the researcher could get the data as shown in Table 2.

Table 2: Description of knowledge about ecg of nurse.

No	Knowledge Level	Frequency (Person)	Percentage (%)
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1	Good	0	0
	Sufficient	51	75,3
	Not Sufficient	17	24,6

Table 3: Description of ability interpreting the basic eeg of nurse.

No	Characteristics	Frequency (Person)	Persentase (%)
1	Rhythm		
	True	31	44,93
	False	38	55,07
2	Frequency		
	True	8	11,59
	False	61	88,41
3	Pacemaker Source		
	True	28	40,57
	False	41	59,43
4	Axis		
	True	8	11,59
	False	61	88,41
5	Extrasystole		
	True	3	4,34
	False	66	95,66
6	Block		
	True	5	7,25
	False	64	92,75
7	Heart Muscle Enlargement		
	True	3	4,34
	False	66	95,66
8	Coronary Heart Disease		
	True	3	4,34
	False	66	95,66
9	Overall Interpretation		
	True	0	0
	False	69	100

4 DISCUSSION

4.1 Demography Age

Based on the result of this study, it was obtained the data that most of the nurses were on the early adult period which was 55 nurses (79.7%), 12 nurses were on the final adolescent phase (17.4%), and 2 nurses were on the final adult phase (2.9%). The nurse at the Universitas Airlangga Hospital has relatively same age and quite young.

Age is an item affecting the growth and development of human physiology. It also affects one's process of thinking. With the increase of someone age, the process of thinking would be more

critical gradually in adult phase. In the early adult phase, one's focus would be emphasized on the job and surrounding socialization. In this age level, someone would spur themselves on competition and productivity. They would use their decent motoric ability in learning to master new skills and use their mental ability to remember things that have been learned before, analogical reasoning, and creative thinking and was supported by the efficient physical ability so that they could compete in their environment (Zhang and Hsu, 2013).

The result of the previous study also showed that in the early adult phase, a nurse would be encouraged and takes part in the competition with their colleagues to show their productivity in their work (Wu, 2012).

Most of the nurses in Universitas Airlangga Hospital were on the early adult phase, so it was implied that that condition could be a big benefit to improve the nursing service. At that state, they have high spirit competitiveness towards their colleagues. Thus, it was expected that this optimal competitiveness atmosphere could bring betterment to the nursing service.

4.2 Gender

Based on the result of this study, it was obtained that most of the nurse was female, which was 59 nurses (85.5%), and the rest were male (14.5%). Overall, the total of nurses in Universitas Airlangga Hospital in all service units was female. This result was suitable with the previous study, which stated that the number of a male nurse (44.3%) was less than a female nurse (56.7%).

This was assumed that the nurse job was preferred by female than it was by male. The nurse job is indeed the basic science as mother instinct so that female is more interested in this job. Even from the school or university, this field was dominated by the female. Even, in fact, there are a lot of nursing activities that need a male nurse to fulfill the basic need of the patient, as an example in the unit that has patients who lose their consciousness and mobility and were helped completely by the nurse and the other sensitive need performed by the opposite sex.

4.3 Working Duration

Most of the nurses had the working experience duration for 1-3 years, which was 48 nurses (69.6%), and the other nurses that had the working experience duration for 3-5 years were 17 nurses (24.6%), and more than 5 years were 4 nurses (5.8%). The nurses at Universitas Airlangga Hospital had relatively

minimal experience and most of them were fresh graduates. The duration of the nurses working affected their knowledge and skills. The longer their duration of work, the better their quality or performance in the nursing care. The working experience would increase their expertise and skills in the working. With that amount of time, the knowledge and skills of the nurse were sharpened with several cases that they handled (Varvaroussis *et al.*, 2014).

The nurses at Universitas Airlangga Hospital had the adequate knowledge, but not with the ECG interpretation ability. This was caused by the fact that they still had minimal experience but obtained more knowledge from the university or autodidact study.

4.4 Last Education

Based on the result of this study, it was obtained the data that the majority of the last education was a Bachelor of nursing (S1 Ners), which was 58 nurses (84.1%) and Vocational of Nursing (D3 Nursing) was 11 nurses (15.9%). According to the Nursing Constitution No. 38 2014 in Indonesia, the professional nurse is bachelor of nursing (S1 Ners), and D3 was a vocational education.

The Bachelor of Nursing (S1 Ners) has a scholarly competency compared to the vocational nursing (D3 Nursing). The high number of nurse with the last education of bachelor of nursing was expected to increase their knowledge that also could improve their performance in the nursing care. The educational level of most of the nurses at Universitas Airlangga Hospital was a benefit in delivering optimal service.

4.5 Employee Status

Based on the result of this study, it was obtained the data that most of the nurses at Universitas Airlangga Hospital had an employee status as honorary hospital employee, which was 54 nurses (78.3%), the honorary university employee was 4 nurses (5.8%) and government employee was 11 nurses (15.9%). The majority of the nurses at Universitas Airlangga Hospital had status as an honorary hospital employee, not only in the inpatient unit but also in every service unit.

The employee status is not defined as a standard in obtaining the opportunity to gain knowledge or skills.

4.6 The Nurse Knowledge about ECG

The knowledge is a result of knowing and it occurred after someone performed sensing to a specific object. The sensing occurred through the human senses; vision, hearing, smell, touch, and taste. Most of the knowledge was obtained through eyes and ears. The knowledge or cognitive is an important domain to form an over behavior (Zhang and Hsu, 2013).

The majority of nurse knowledge level in this study as sufficient were 51 nurses (75.3%) and not sufficient of 17 nurses (24.6%). The knowledge of the inpatient unit nurses at Universitas Airlangga Hospital could be said as fairly good. But, there were still some nurses who could not interpret the ECG result.

This caused worries on the nurse ability at analyzing the result of ECG. It was worried that the nurse could not recognize the change of condition on the heart. This could not only happen in the emergency unit and intensive unit, but also in the inpatient unit. The better knowledge of the nurse in interpreting the ECG result would simplify the monitoring and management of the patient during their stay in the inpatient unit so that the change of condition of ECG in the emergency condition could get an intensive handling immediately.

The lack of knowledge level might arise due to the lack of curriculum during school and the skills on interpreting the ECG result could be learned from training. The data at Universitas Airlangga Hospital said that only 1 of 97 (1.03%) had been certified at ECG training.

The effect of ECG training to nursing knowledge in interpreting ECG on the previous training showed that there was a difference of the nurse knowledge score average before and after ECG training with a p value of 0.001 ($p < 0.005$) (Raupach *et al.*, 2016).

4.7 The Ability of The Nurse on Interpreting the Basic ECG

The ability of the nurses was based on their knowledge, but when someone has good knowledge, it was not always accompanied by good skills. In the previous study, it was found a correlation between the education level and knowledge, and affected the skills on ECG (Zhang and Hsu, 2013).

4.8 Rhythm

The result of this study showed that 31 nurses (44.93%) could interpret the ECG rhythm correctly, and the rest still could not interpret the ECG rhythm correctly. The rhythm is a method to identify the electricity produced by the pacemaker source whether it is regular or there is an abnormality that makes the distance between the electric waves of the heart irregular. The nurse ability was fairly good in identifying the rhythm appearing in the ECG result so that they could give the right management if there is a disturbance on the heart rhythm.

4.9 Frequency

The result of this study showed that 8 nurses (11.59%) could calculate the frequency of the patient's heart through ECG correctly, while 61 nurses (88.41%) was not able to calculate the ECG frequency correctly.

The heart rate in every minute is one of the indicators of heart workload. The ability to calculate the heart frequency through the ECG was less owned by the nurses. But, this could be performed by conducting an easier physical examination on the patient so that the response time is faster.

4.10 Pacemaker Source

The result of this study showed that 28 nurses (40.57%) could determine the pacemaker source from the ECG correctly, while 41 nurses (59.43%) could not determine the pacemaker source from the ECG correctly.

The normal pacemaker source on the human heart was placed at SA Node. If the SA Node could not bring up and produce impulse, then the ECG result would be changed. This change still could not be detected by some nurses so that the type of action could not be determined for the next step.

4.11 Axis

The result of this study showed that 8 nurses (11.59%) could determine the heart axis from the ECG correctly, while 61 nurses (88.41%) could not determine the heart axis from the ECG correctly.

The heart axis is an image of the heart position or the electricity path behaves. If a patient's axis were disturbed, there would be a wave abnormality on the ECG image. If the patient's heart axis could not be determined, there could be a wrong interpretation

when reading the ECG result. It could be read as abnormal ECG while in fact, it is the normal one.

4.12 Extrasystole

The result of this study showed that 3 nurses (4.34%) could determine the presence of extrasystole from the ECG correctly, while 66 nurses (95.66%) could not determine the presence of extrasystole from the ECG correctly.

The presence of extrasystole on the ECG result is an early sign that there is an abnormality in the heart electricity. If this extrasystole was ignored and without intensive handling could lead to an arrhythmia that threatens the life of the patient.

4.13 Block

The result of this study showed that 5 nurses (7.25%) could determine the presence of block from the ECG correctly, while 64 nurses (92.75%) could not determine the presence of block from the ECG correctly.

The knowledge about the block is crucial to be known by the nurse to identify the presence of impulse conduction interference in the conduction path. When the nurse could detect a block faster, then the help to the patient with conduction interference could be optimal.

4.14 Heart Muscle Enlargement

The result of this study showed that 3 nurses (4.34%) could determine the presence of heart muscle enlargement from the ECG correctly, while 66 nurses (95.66%) could not determine the presence of heart muscle enlargement from the ECG correctly.

The method used to determine the presence of heart muscle enlargement is not only by using ECG. There are a lot of other examination that could be used. ECG is one of the simple methods to observe the presence of heart enlargement and could be treated if the heart workload is too big.

4.15 Coronary Heart Disease

The result of this study showed that 3 nurses (4.34%) could determine the presence of coronary heart disease from the ECG correctly, while 66 nurses (95.66%) could not determine the presence of coronary heart disease from the ECG correctly.

The ECG examination was used for early detection and evaluation on the presence of heart attack on the patient. When in the ECG image was

found the presence of heart attack, ischemia or infarct to be treated. After treating, the evaluation of the treatment result is also by using ECG examination.

4.16 Overall Interpretation

The result of this study showed that no one could conclude the overall ECG result correctly. This was caused by the lack of nurse knowledge about reading the ECG result so that in the end, there was no correct overall interpretation.

The nurse relatively relied on the ECG interpretation result from the device compared to reading the ECG result directly. Some previous studies stated that the error level of device reading was relatively big because the device could not verify the physical condition or patient complaints.

5 CONCLUSIONS

Knowledge possessed by the nurse to the ECG interpretation was quite good, but it was not accompanied by the ability to interpret the ECG result.

Nurse at UniversitasAirlangga Hospital need an opportunity to improve their ability and skills in interpreting the ECG result, considering the potential of UniversitasAirlangga Hospital nurse was good. The combination of the young age as the eagerness to learn and thrive is still high, a good education level as the intelligence level is high, the short working experience as they want more skills and high opportunity to study because they are in the education environment, which is UniversitasAirlangga.

The method selection in improving the ability and skills in interpreting the basic ECG is important as an effective form in the service and learning time. The increase in the ability and skills of the nurse in interpreting the ECG result is expected to improve the service and response time to the patients with heart disease in UniversitasAirlangga Hospital.

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