Research Article

Correlation Between Healthcare Practitioners Education and the Usability of Precordial ECG SafOne

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Abstract.
Performing electrocardiogram (ECG) recordings using the standard method presents a challenge to healthcare practitioners because of the need to precisely locate the six precordial electrodes or lead according to the six thoracic landmarks. A new method using precordial lead *ECG SafOne* was introduced to healthcare professionals and compared to the precordial lead standard. The study aims to identify the correlation between healthcare practitioners' education and the usability of the precordial ECG SafOne. This study employed a quantitative descriptive design using a user-centered design survey method. Two hundred twenty-eight healthcare practitioners, including doctors and nurses from three hospitals in Pekanbaru, Riau, Indonesia, participated in this study and were selected using the purposive sampling technique. Evaluation variables assessment was collected using the precordial ECG SafOne questionnaire. The data analysis used was Spearman Rho to identify the correlation between the two variables investigated. Demographic data depicts that most of the participants were nurses 215 (94.2%), healthcare practitioners education background with Diploma 107 (46%), registered nurses 108 (47.4%), and Doctors 13 (5.7%), and average age was the early adult stage, 103 participants (45.2%). The bivariate analysis results show a correlation between healthcare practitioners' education and usability of the precordial ECG SafOne with a *p-value* of 0.029 (*p-value < 0.05*). In conclusion, healthcare practitioners appraise the precordial *ECG SafOne* as an effective, applicable, practical, and renovate tool and valuable for electrocardiogram recordings in patients with cardiovascular diseases.

Keywords: education, usability, electrocardiography, SafOne, healthcare practitioners

1. INTRODUCTION

Monitoring patients with cardiovascular disease using ECG is required to prevent injury and death caused.[1] Accurate placement of ECG electrodes according to the six body points is essential for cardiac diagnostic testing to produce valid results and correct interpretation of ECG recordings.[2] However, performing ECG recordings using the

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standard method presents a challenge to healthcare practitioners because of the need to precisely locate the six precordial lead according to the six thoracic landmarks.[2–4]

The industry and researchers have an important role to play in preparing products and improving everyday lives by facilitating the use of new technologies and integrating them to wider range of people, such as people with cardiovascular problems. The rapid development of technology impacts improvement in the health sector. In the last two decades, health instrument innovations in the cardiovascular have been invented worldwide.[5,6] One of these innovations is the innovative design of the ECG device called the precordial lead ECG SafOne. Precordial ECG SafOne is a modification of the precordial lead for ECG recording aimed to assist healthcare practitioners in locating V1-V6 accurately at one step.[7]

According to the user-centred design approach, new health tool innovations, including ECG SafOne, require evaluating the use of the tool in the field to see the efficiency and quality of the equipment used by health workers.[8,9] One of the studies on ECG modification by Wong et al.[10] evaluated their invention by health workers to acquire feedback on the tool and found it significantly helpful. Therefore, ECG SafOne also requires to assess and evaluate its usability and functionality in practice.

Evaluation from the experience of healthcare professionals as a user is critical because the user's evaluation experience could help increase performance innovation, such as the ECG SafOne device.[11] The effectiveness of precordial ECG SafOne needs to be evaluated by healthcare professionals in their daily practice. Feedback related to how they see ECG SafOne as a functional, efficient and practical tool is essential for the compatibility of ECG SafOne. However, every healthcare provider's characteristics, such as educational background and experiences using ECG, may influence how they perceive ECG SafOne in terms of its usability. Therefore, this study investigated the correlation between healthcare professionals' education and the usability of the precordial ECG SafOne.

2. MATERIALS AND METHODS

This study used a descriptive method and a user-centred design of questionnaire survey forms to collect data related to the usability of ECG SafOne. The sample of this study was 228 healthcare professionals from three different types of hospitals consisting of nurses and doctors who were selected using purposive sampling. The sample criteria are: 1) agree to involve in the study, 2) currently working at ICU, CVCU, ER and cardiovascular wards. Each nurse and doctor used ECG SafOne before filling in the survey. The data

analysed used Spearman Rho to see the correlation between healthcare professionals' education and the usability of ECG SafOne. Ethics clearance for this study was obtained from the Ethics Committee for Health Research and Nursing Faculty of Nursing, University of Riau, with certificate No. 343/UN.19.5.1.8/KEPK.FKP/2022.

3. RESULT

3.1. Characteristics of Respondents

TABLE 1: Characteristics of Respondents.

No.	Characteristic of respondents	Frequency (n=228)	Percentage (%)
1.	Age Late teens Early adult Late adult Early elderly	21 103 82 22	9.2 45.2 36.0 9.6
	Total	228	100
2.	Healthcare practitioners' education background Diploma Registered Nurse Doctor	107 108 13	46.9 47.4 5.7
	Total	228	100

Based on table 1, the majority of respondents are at the age of early adults, 103 respondents (45.5%), and the majority are education-background registered nurses, 108 (47.4%) and diploma nursing, 107 (46.9%).

3.2. The Usability Of Precordial ECG SafOne

TABLE 2: The usability of precordial ECG SafOne.

No.	Variable	Frequency (n=228)	Percentage (%)
1	Usability aspect SafOne's ECG technology is practical, and efficient, and shortens the measurement time needed by health workers. SafOne's ECG technology is impractical, and efficient, and shortens the measurement time required by healthcare workers.	201 27	88.2 11.8
	Total	228	100

Table 2 depicts that most respondents agree that SafOne's ECG technology is practical, efficient and shortens the measurement time needed by health workers, as many as 201 respondents (88.2%).

3.3. Correlation of healthcare practitioners' Education and usability of precordial ECG SafOne

TABLE 3: Correlation of healthcare practitioners' education and the usability of precordial ECG SafOne.

No	Variable	Usability Aspect				P value
1	Healthcare Practitioners' Education	SafOne's ECG technology is practical, and efficient, and shortens the measurement time needed by health workers.		SafOne's ECG technology is impractical, and efficient, and shortens the measurement time required by healthcare workers.		
		F	%	F	%	
	Diploma	100	43.9	7	3	0.029
	Registered nurse	91	39.9	17	7.46	
	Doctor	10	4.4	3	1.3	
	Total	201	88.2	27	11.8	

Based on table 3 shows there is a connection Between Health Care Practitioners' Education and with usability of the precordial ECG SafOne with a p-value of 0.029 (p-value < 0.05).

4. DISCUSSION

In general, healthcare practitioners perceive the usability of ECG SafOne as practical and helpful when they apply it in practice. This study's results show that most respondents are in the category of early mature age and have a higher and sufficient education background. According to Wu[12], healthcare practitioners' critical thinking ability in adapting new knowledge, new invention and interpretation of ECG recording results is influenced by age and education. To some extent, healthcare professionals' maturity and educational background improve the quality of health services. Moreover, a study conducted by Tambariki et al.[13] stated that a higher and sufficient education level could improve nurses' understanding so that their knowledge develops and applies directly to their daily health services. Critical thinking and fast adjustment in implementing the new invention, especially in nursing care, are critical. Thus, the result of the study showed that most respondents are Registered Nurses and Doctors at the average early mature age and sufficient education and reflected the significant correlation regarding adaptability in using the new ECG SafOne.

Many studies show that users trials are effective methods of a accessibility evaluation as they highlight problems that the designer or researcher would not realise by their

assessment. Indeed, direct user participation is helpful and allows for a significant response. Regarding usability aspects, finding of this study shows that most respondents agree that SafOne's ECG is practical, efficient, and shortens the measurement time needed by health workers. There are differences in the procedure for inserting the precordial leads ECG SafOne and the standard ECG. The standard ECG installation needs to identify one by one V1-V6 position while using ECG SafOne to determine the position of precordial lead only needs to identify the V1 location, then V2-V6 are automatically detected.[4] The work of ECG SafOne to locate the six precordial thoracic shows that the precordial ECG SafOne is more practical than standard ECG. The practical aspect of ECG SafOne is not only to identify the landmark of six thoracic lead faster but also in terms of time efficiency. The Triamanda et al.[14] study showed a difference in the length of time for the installation of a standard ECG with the SafOne precordial lead. The installation time of precordial lead using the precordial ECG SafOne is faster than the installation time of the standard ECG. This study result is in line with the user-centred design concept that states that in order to meet the requirement of the innovation, it must be efficient and increase user productivity.[15]

Finding of this study showed a significant correlation between healthcare practitioners' education and the usability of precordial ECG SafOne. The findings of this study align with the study conducted by Marlisa & Pratiwi[16], which stated that each education level significantly affects healthcare practitioners' to adapt and effectively adjust their practice. Moreover, a study conducted by Tambariki et al.[13] stated that higher education could improve healthcare practitioners' intelligence to apply any new evidence in their daily practices. Thus, ECG SafOne is compatible and worthwhile for healthcare practitioners to use in their practices, and it significantly considers a valuable tool. Technology innovations in health require direct users participation to enable researchers or designers to understand users needs based on their practices.

5. CONCLUSION

User participation in assessing and evaluating new tools in health is strongly recommended to identify their impact on usability. It means that such a tool should be easily integrated to any characteristics of users and provides benefits of using it becomes the priority for the researchers and designers. The findings of this study showed that educational background of the healthcare practitioners significantly correlates with the usability aspect of precordial ECG SafOne. Therefore, precordial ECG SafOne offers

better solutions and provides worthy implications for healthcare practitioners to perform ECG examinations in their practice.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

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