

Comparing the Effect of Two Teaching Methods on Nursing Students' Electrocardiography Interpretation Knowledge

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Abstract

Aims: Due to the importance of the correct interpretation of electrocardiograms in the quality of medical services, new educational methods are increasingly being implemented and evaluated. In this regard, the purpose of this study was to compare teaching methods through smartphones and tutorial handbooks in the level of knowledge of electrocardiography interpretation in nursing students.

Materials & Methods: This experimental study with a pre-test and post-test design and a control group was conducted in final-semester nursing students of Khoi Faculty of Medical Sciences (n=35) and Khoi Islamic Azad University (n=35) in 2023. A questionnaire containing 30 questions related to interpreting the ECG in six major topics were used to collect data. Statistical analyses were performed using SPSS 22 software. The comparison between groups was conducted using Chi-square and independent sample T-tests.

Findings: The pre-test students' average scores were 18.64 ± 2.44 in the smartphone group and 18.32 ± 2.28 in the self-learning handbook group ($p=0.635$). These findings indicated the homogeneity of the two groups in terms of the knowledge of ECG interpretation before the intervention. There was a significant difference between the average scores of the two groups after the intervention, and education through smartphones was more effective on students' knowledge than education using the handbook method ($p<0.0001$).

Conclusion: Education through smartphones has a positive effect on nursing students' knowledge about the interpretation of ECG.

Keywords

Education [<https://www.ncbi.nlm.nih.gov/mesh/68004493>];
Smartphone [<https://www.ncbi.nlm.nih.gov/mesh/2009913>];
Self-Learning Handbook [Not in MeSH];
Electrocardiography [<https://www.ncbi.nlm.nih.gov/mesh/68004562>];
Nursing Students [<https://www.ncbi.nlm.nih.gov/mesh/?term=Nursing+Students>]

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Introduction

An electrocardiogram (ECG) is one of the most useful diagnostic tools for diagnosing and evaluating heart disorders. ECG is a low-cost, easy, fast, and safe tool that provides valuable information to healthcare professionals and is an important diagnostic tool for patient health [1]. ECG interpretation is an important clinical skill that helps rapidly diagnose life-threatening disorders. However, misinterpretation of an ECG can lead to inappropriate clinical decisions with serious negative consequences, especially in arrhythmias and myocardial infarction [2, 3].

Therefore, learning to read and interpret ECG is necessary for doctors and nurses, highlighting the importance of proper and timely training for students on how to read and interpret ECG [4].

The lecture method is currently the main method of teaching electrocardiograms in many classes [5, 6]. In contrast, the results of many studies comparing the lecture method with other teaching methods have shown that the lecture method has a lower efficiency than other teaching methods [7-9].

Nowadays, in education, the effort is that the learners participate in the acquisition of the concept and learning process in different ways, and to achieve this goal, the use of active educational methods is emphasized [10].

New communication methods and spaces are provided today, making the learning process possible outside the classroom [11]. Mobile phone technology, available to all members of society today, has provided a valuable opportunity for professors and students. To make use of the continuity and depth of the teaching and learning process, mobile phone technology can increase students' enthusiasm for learning without having time and place limitations and provide the opportunity to learn in dead and dynamic times [12, 13].

Education through mobile phone technology can provide educational content to students with images, animations, sounds, and educational clips [14], considering that there is still a specific coordinated program based on principles. There are no teaching techniques to use this technology as an educational aid; teaching is often done through lectures, so this study was conducted with the aim of the effect of teaching ECG interpretation through smartphones compared to teaching by lecture method on the knowledge level of nursing students.

Materials and Methods

This experimental study with a pre-test and post-test design and a control group was conducted in final-semester nursing students of Khoy Faculty of Medical Sciences (n=35) and Khoy Islamic Azad University (n=35) in 2023. Through a lottery, 35 nursing students of the Faculty of Medical Sciences were placed in the experimental group, and 35 Khoy Islamic Azad University nursing students were

placed in the control group. Passing the cardiovascular and special care courses was the inclusion criterion, and not being satisfied with continuing to participate in the research and participating in a similar educational program at the same time were the exclusion criteria.

A demographic characteristics questionnaire and a questionnaire containing 30 questions related to interpreting the ECG in six major topics (the basics of ECG, supraventricular arrhythmias, ventricular arrhythmias, ventricular and branchial atrioventricular blocks, junctional rhythms, pacemakers, and types of infarcts) were used to collect data. Each question on this test had one mark, and a negative mark was not considered for this test. Therefore, the maximum score assigned to this test was 30. The tool was delivered to 10 academic members of the Khoy Faculty of Medical Sciences and Nursing Department of Azad University for validation. The final changes were made according to their suggestions, and the questionnaire was approved. To determine reliability, 20 nursing students completed the questionnaire, and its reliability was obtained using Cronbach's alpha as 0.87.

The training was done through a smartphone using Telegram and WhatsApp messengers in the form of images, clips, and audio. For the control group, the training was done by self-learning in the form of a handbook prepared by the researcher, and it was arranged under the supervision of a cardiologist and provided to the students. The duration of training for both groups was two weeks. Before the training, two groups were subjected to a pre-test. To monitor the level of memorization given to the nurses, one week and then three months after the training, both test and control groups were re-tested.

Statistical analyses were performed using SPSS 22 software. The comparison between groups was conducted using Chi-square and One-way ANOVA.

Findings

52% of the participants were male and 48% were female ($p > 0.05$).

The pre-test students' average scores were 18.64 ± 2.44 in the smartphone group and 18.32 ± 2.28 in the self-learning handbook group ($p = 0.635$). These findings indicated the homogeneity of the two groups in terms of the knowledge of ECG interpretation before the intervention.

Table 1. Average pre-test and post-test scores of nursing students regarding the knowledge of ECG interpretation in the smartphone group and the self-learning handbook group

Group	Pre-test	Post-test 1	Post-test 2
Smart mobile phone method	18.64 ± 2.44	22.12 ± 2.24	21.08 ± 2.17
Self-learning handbook method	18.32 ± 2.28	18.80 ± 2.02	18.48 ± 1.98
p-Value	0.635	0.0001	0.0001

There was a significant difference between the average scores of the two groups after the intervention, and education through smartphones was more effective on students' knowledge than education using the handbook method ($p < 0.0001$; Table 1).

There was no statistically significant difference between the average scores of pre-test and post-test 2 in the group of self-learning manual training ($p = 0.212$).

Discussion

The study's findings showed no significant difference between gender and the level of knowledge before and after the intervention. Mohammadi *et al.* [15] and Ebrahimian *et al.* [16] showed no statistically significant relationship between gender and the knowledge level of nurses in special departments.

The study's findings showed that education through smart mobile phones was more effective in students' knowledge of ECG interpretation. Teaching through a self-learning handbook one week after training increased knowledge, but three months after training, it did not affect the retention of students' knowledge, but training through smart mobile phones increased students' knowledge in both stages of the post-test. In a study, Zhang *et al.* showed that lecture-based training increased the average scores of nurses two weeks and four months after the training, and the method of training through the handbook only one month after the training increased the average scores of nurses and after one month it did not have an effect on the durability of nurses' knowledge [17].

Sasikala conducted a study on the effect of a structured training program on the knowledge of electrocardiogram (ECG) interpretation in intensive care nurses. The results showed that nurses' average knowledge level increased significantly after the intervention [18]. The findings of the study showed that both educational methods initially increased the knowledge of nursing students, which was consistent with the studies of Bakai [19] Horiyoshi *et al.*, [20] Jeffris *et al.*, [21] Sheikh Abu Masoudi and Soltani Melayeaqoubi [6]. Habibzadeh *et al.*, in a study aimed at examining virtual education compared to the lecture method, showed that the use of the virtual education method was effective on the knowledge of nursing students, and lecture education did not affect the students' knowledge [3].

In a study aimed at game-based learning to improve the performance of nursing students in electrocardiogram training, Chang *et al.* showed that two weeks after the training, the amount of knowledge in the intervention group with game-based learning had a statistically significant difference compared to the traditional lecture method. In addition, game-based learning improved

students' performance, attitude, motivation, and critical thinking [23].

Cheong *et al.* conducted a study on the preference and readiness of nursing students for mobile learning. The study results showed that nursing students like to access their learning materials anytime and anywhere. Among the various study topics, students highly preferred that body systems diseases and medical terms be presented in multimedia materials on mobile devices. Based on these findings, the challenges and opportunities of mobile learning in nursing education have been discussed. The unique features of mobile learning have been suggested for nursing education [24].

The main obstacle against the growth and spread of mobile education is the limitations and the unavailability of the required hardware. Therefore, it is necessary to provide the necessary platforms so that more people can use this method and learn through it.

Conclusion

Education through smartphones has a positive effect on nursing students' knowledge about the interpretation of ECG.

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