ETHIOPIAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 03, March-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

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AN ALTERNATIVE METHOD OF TEACHING AND LECTURING FOR MEDICAL STUDENTS

Abstract: An electrocardiogram (ECG) remains one of the most important diagnostic tools in healthcare in terms of screening, early diagnosis, and treatment of cardiovascular disease (CVD) [2]. Accurate interpretation of the ECG by medical professionals significantly improves treatment outcomes, especially in acute myocardial infarction or cardiac arrest. The true advantage of taking and monitoring an ECG lies solely in the doctor's competence in accurately interpreting the ECG [1]. As a result, teaching ECG to medical students is one of the most important and challenging curricula in the world [3].

Key words: Electrocardiogram, traditional, virtual, study, student.

An electrocardiogram (ECG) is a fundamental, cost-effective test for evaluating a wide range of cardiac abnormalities. An important part of any medical education curriculum is teaching students how to interpret ECGs. Even though new technologies and artificial intelligence (AI) have begun to interpret ECGs more directly in recent years, it should be kept in mind that due to the nascent nature of research, the implications of the extent to which AI can supplant human interpretation of ECGs remains to be seen. Therefore, all physicians must master the ability to interpret ECGs. A variety of pedagogical strategies are used to teach ECG interpretation, such as self-paced learning (SDL), internet-based learning, lecture training, seminar, contrastive and non-contrastive, and clinically integrated methods[4].Each of these educational strategies has its advantages and disadvantages, and it is up to educational institutions to use the best possible one, given their capacities and culture. Randomized controlled trials, as one of the most reliable types of research in the hierarchy of evidence, are the best way to compare educational interventions. However, blinding may not be applicable to educational interventions because both teachers, and students learn the method of teaching. Several studies conducted in recent years have compared the above-mentioned educational strategies for teaching ECGs to medical students[5]. However, knowledge is still expanding, and to date there has been no review study that comprehensively evaluated these methods. Given the great importance but low competence of ECG interpretation in medical students, we aimed to systematically and qualitatively analyze the current literature on the teaching of ECG clinical trials in the Bachelor of Medical Education (UME). Traditional ECG training has focused on the delivery of the content in didactic form with a case-based approach and combined with demonstrations in practical classes. Studies have also shown that blended learning involving technology like web-based tutorials was effective in achieving better competency levels[5]. The National Medical Commission of India, in a competency-based curriculum, has made ECG one of the certifiable competencies for final-year undergraduate medical students. We, therefore, designed a new approach to train undergraduates in the

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interpretation of ECG using virtual reality to determine its effectiveness in acquiring and retaining the skills to interpret ECG as compared to the traditional approach.

A rapid change in the practice of medical education began in 2019 with the emergence of the global COVID-19 pandemic, which disrupted the functioning of healthcare systems around the world . Given the high contagiousness of the virus, traditional courses could not continue as usual, and online courses were offered to medical students as an alternative method of teaching and lecturing . The potential advantages or disadvantages associated with the effectiveness of the noted structural changes in the means of education led to contradictory conclusions. Despite lower levels of learning, confidence, and engagement compared to the previously used face-to-face method, the scores remained unchanged or improved significantly. The meta-analysis showed that ECG competence did not differ between students in terms of face-to-face and online learning [7]. Participants, regardless of their scores, were divided into three groups. The form of training in each group was based on lectures. We hypothesized that all participants, regardless of their score, had no information about ECG interpretation. The first group trained an ECG for 20 hours face-to-face (N=35), the second group spent 20 hours studying online (N=85), and the third group (N=95) studied an ECG using a blended method that consisted of 10 hours of face-to-face training and 10 hours of online training. For online courses, we used (Technologies, 2022. Zoom, while face-to-face courses were held in traditional classrooms. In any of these methods, both students and teachers could ask and answer questions. Online courses were synchronous, and students were required to participate twice a week in an online subgroup and once a week in a mixed subgroup. Regardless of the subgroups, each course was held in ten two-hour sessions. The same instructors and similar training materials, including PowerPoint slide sets and media, were used for all participants, regardless of their training subgroups.

We applied the convenient sampling method, and all interns and residents who had to study ECG for the first time in their course during the training period took part in the study. As the study was conducted in the context of the Covid-19 pandemic, students in each subgroup were selected according to their choice.
The self-assessment questionnaire consisted of nine questions. Participants were asked to rate their ECG interpretation skills with respect to the patient's heart rate, heart rate, cardiac axis, ventricular hypertrophy, atrioventricular block (AV block), bundle bundle block (BBB), anatomical location of myocardial infarction (MI), and electrolyte imbalance (a Likert score of 1 to 5.5 showed the highest proficiency). For each correct answer 1 point was awarded, and for each participant, the total score from 0 to 9 was calculated. A higher overall score on the self-assessment test before the exam was assumed to indicate participants' confidence in interpreting the ECG. Two hundred and fifteen people were examined, including 105 (48.8%) men and 110 (51.2%) women. The mean age of men and women was 25.57 ± 4.48 and 25.51 ± 2.57 years, respectively ($p = 0.90$). Twenty-six (12.1%) participants were residents and 189 (87.9%) were trainees. Thirty-five (16.3%), 85 (39.5%) and 95 (44.2%) participants were trained in person, online and mixed methods, respectively. then 118 (54.9%) preferred face-to-face learning, while the remaining 97 (45.1%) chose online learning ($P < 0.001$).

Even though the participants in the mixed method seemed more confident in their knowledge in almost half of the questions, their average total self-assessment score was similar ($p = 0.108$). In this study, we found that the blended method was a better approach to learning, resulting in higher participant scores. However, it showed that most of the participants preferred face-to-face courses to

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online courses. Our study found that the average total score of students who studied ECGs using a blended learning approach was significantly higher than those in the other groups.

Blended learning can lead to a better understanding of ECGs by students for a variety of reasons. Blended learning can provide students with more of the net time they spend studying EKGs instead of wasting their time on long and time-consuming face-to-face courses, as well as the opportunity to contract with each other and their professors to ask questions and solve their problems. The brief description of virtual reality (VR) simulation is as follows. Each student was assigned a workstation with a virtual reality simulation, where each one of them had to wear a VR headset and access the virtual room with a patient. They did an ECG of the patient by virtually placing the leads and recording the ECG. After this, they were asked to interpret it. Students were allowed to select the module they wanted to learn - normal or abnormal ECG. Students were also guided by the faculty for any explanation required by them. Although a faculty was there to help them if required, VR simulation was a method of self-directed learning. They had an opportunity to access the module multiple times. In the traditional teaching group, the students were taught by chalk and board, and ECG were projected using an liquid-crystal display (LCD) projector. Then, they were asked to interpret the ECG. In the traditional teaching group, students were advised to refer to textbooks for a better understanding of ECG[7].

In conclusion, while most students preferred face-to-face learning to online learning, the blended method seemed to be more promising in terms of improving students' ECG interpretation skills. The results of this study imply that medical students and medical school teachers would be better off moving from traditional approaches to face-to-face learning to more modern approaches, such as blended approaches. However, we recommend further training on other topics and larger study groups.

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