Face-to-Face Versus Online Training Method and their Impact on Practical Skills of Medical Students in ECG Interpretation

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ABSTRACT

Present study aims to focus on the comparison of face to face and online training through Telegram application for emergency medicine residents in diagnosis and Echocardiography (ECG) interpretation. This quasi-experimental study was conducted by participation of 140 medical students studying emergency medicine in Isfahan University of Medical Sciences during 2016-2017. Individuals were divided into two groups of 70 students trained for ECG interpretation by two methods including face to face and a mobile communication application (Telegram). To assess the ECG interpretational and diagnostic skills of participants before and after the training, we used the same test and recorded correct answers percentage and their scores. Data, were analyzed using SPSS Software. In face to face group, the mean score of students before and after training were 12.3 ± 2.37 and 16.53 ± 1.99 respectively, while in online class group, the mean score of students before and after training were 12.12 ± 2.06 and 16.56 ± 2.11 respectively; a significant increase in level of knowledge and skills of ECG interpretation in both groups were noted, but the increase in the knowledge level and skills of ECG interpretation after training was not significantly different between groups. Due to commuting problems of students to medical training classes and difficulty attending classes in some cases in addition to convenience of instant messaging and social softwares and publicly availability and accessibility of information on mobile phone at any time, this approach can be used as a standard medical training classes in future.

Key words: Online Training, Instant Messaging Application, Face to Face Training, Education Technology

INTRODUCTION

With the expansion of information technology and penetration of mass communication media into the society, tools and training methods have also changed; so that with the advancement of technology, using new tools for transferring knowledge is warranted. Nowadays, with the rapid growth of multimedia systems and related technologies to networking, e-training and learning methods are developing and also face to face learning is leading to learning in virtual environments as a new method in training skills. The aim of this approach is to help students develop skills to higher levels [1].

Capability Based Training (CBT) is a systematic learning approach to develop the student's actual abilities. Using virtual simulation techniques help learners practice techniques without pre-set routine and by reducing the probability of risks, contribute to the development of standards. Several studies suggested beneficial effects of using training by virtual systems regarding various medical courses [2].

Also, learners and teachers in other medical sciences are applying virtual simulation systems, e-learning and self e-learning regarding training of students and taking advantage of positive outcomes of training [3].

Acute heart disease is one of the most serious and common problems threatening human life. According to World Health Organization (WHO) statistics, cardiovascular disease is considered as

the most important cause of mortality in the world. For the diagnosis of life-threatening disorders, Echocardiography (ECG) monitoring should be applied at the earliest time. Due to the presence of the doctors on the front lines of patient care, they should be equipped with an adequate knowledge and expertise in diagnosis and interpretation of ECG to prevent from occurring deadly effects of these disorders.

This would be provided through sufficient and appropriate training. Though, no methods of training absolutely gain advantage compared to other methods of training; but when achieving desired training objectives would be possible through active methods in which learner are required to be engaged more, the active methods could be preferred rather than passive methods. Using advanced teaching strategies, help individuals learn more and faster.

Due to the requirements made by today's world, the need for more flexible training methods is considerably tangible.

With the rapid expansion and applying internet in academic centers, increasingly, the need to choose procedures to take advantage of this technology can be felt.

Also, it seems essential to conduct some research about applying internet in learning processes and factors affecting these.

Increasingly expansion of access to appropriate hardware and software for e-teaching has opened up new horizons in front of institutions that can be led to the realization of some training objectives to improve quality of training. This type of training can be taken into account as an active, lifelong and learner centered approach.

With regard to the necessity of training medical students about interpretation of ECG and also considering new methods of training, this study aimed to examine the effectiveness of methods of training to interpret ECG including face to face training method and online training method.

MATERIALS AND METHODS

This quasi-experimental study with the aim of comparing two methods for interpretation of ECG including face to face training and training through instant massaging mobile application

called "Telegram" has been conducted for training medical students of Isfahan University of Medical Sciences (IUMS) studying emergency medicine in 2016-17. We selected 140 students using simple random selection and divided them into two groups of 70 students.

These students were as interns of emergency medicine with oral consent to participate in the study at baseline. We excluded students who passed internal medicine or cardiology before starting emergency medicine course or students who did not attend in the final test (pro-test) of this study.

It should be noted that considering all students are interns in emergency medicine; they all have passed the same practical and theoretical curriculum prior to internship in IUMS and these cases are not considered as confounders.

To run the test, first we designed a test included diagnosis and interpretation sections in which 12 items about ECG interpretation such as Rate, Rhythm, Axis, P wave, PR interval, Q wave, QRS, ST elevation, ST Depression, T wave, QT interval, U wave and 8 items about diagnosis such as Arrhythmias, Blocks, ST-T changes & ACS, Ventricular Hypertrophia, Atrial Enlargement and other diagnosis such as PAC, PVC, WPW, Pericarditis, Digoxin Toxicity, Hyperkalemi were provided. Then we asked students to specify the correct answers in the provided ECG (All Provided ECG was the same) and therefore, we estimated their knowledge of diagnosis and interpretation of ECG and we marked them out of 20.

Then, both groups began the training by two mentioned methods. For students in face to face training group, 12 sessions during two months were held by attending some of students, teachers and senior assistants and as planned before, common ECGs were presented as clinical cases and by group discussion, the final diagnosis and interpretation were considered.

Then, we divided students into two groups through simple randomization and then trained them, separately, based on classic training and virtual training by Telegram. It should be noted that the participant would suppose the aim of study is only training, for he/she was not aware of the comparison of two training methods as the main objective.

Also, for student in the online training group, we created a Telegram channel and weakly, for two months, we send training materials and various pre-provided ECGs with relevant explanations and interpretations, approved by training board. The content of these materials and materials provided in classes were the same. In this Telegram channel, only channel administrator who was an attending physician or a senior resident, posted educational materials and members of this channel could only communicate with channel administrator and ask their questions and receive required responses.

Then, at the end of the training process, we applied the primary test with the same ECG as we used as the primary ECG for all students and again, we calculated correct answers and their scores and then recorded the final results.

It should be stated that we excluded students who did not attend in FAQ in Telegram or were absent for more than two sessions or were absent in the final test. Therefore sample size reduced in face to face training group and training group by Telegram to 56 and 58 students, respectively.

Ultimately, we labeled two groups by letters "a" and "b" to avoid any bias from analyzer's side. Then the collected data from both groups entered into SPSS software version 20, and as the descriptive statistics we applied mean, standard deviation, frequency, frequency percentage and so on, while we applied tests such as independent t-test, paired t-test and qui squared as the inferential statistics. Finally after the conclusion, we used the title of methods instead of labels. For all analyzes we considered the significant level as less than 0.05.
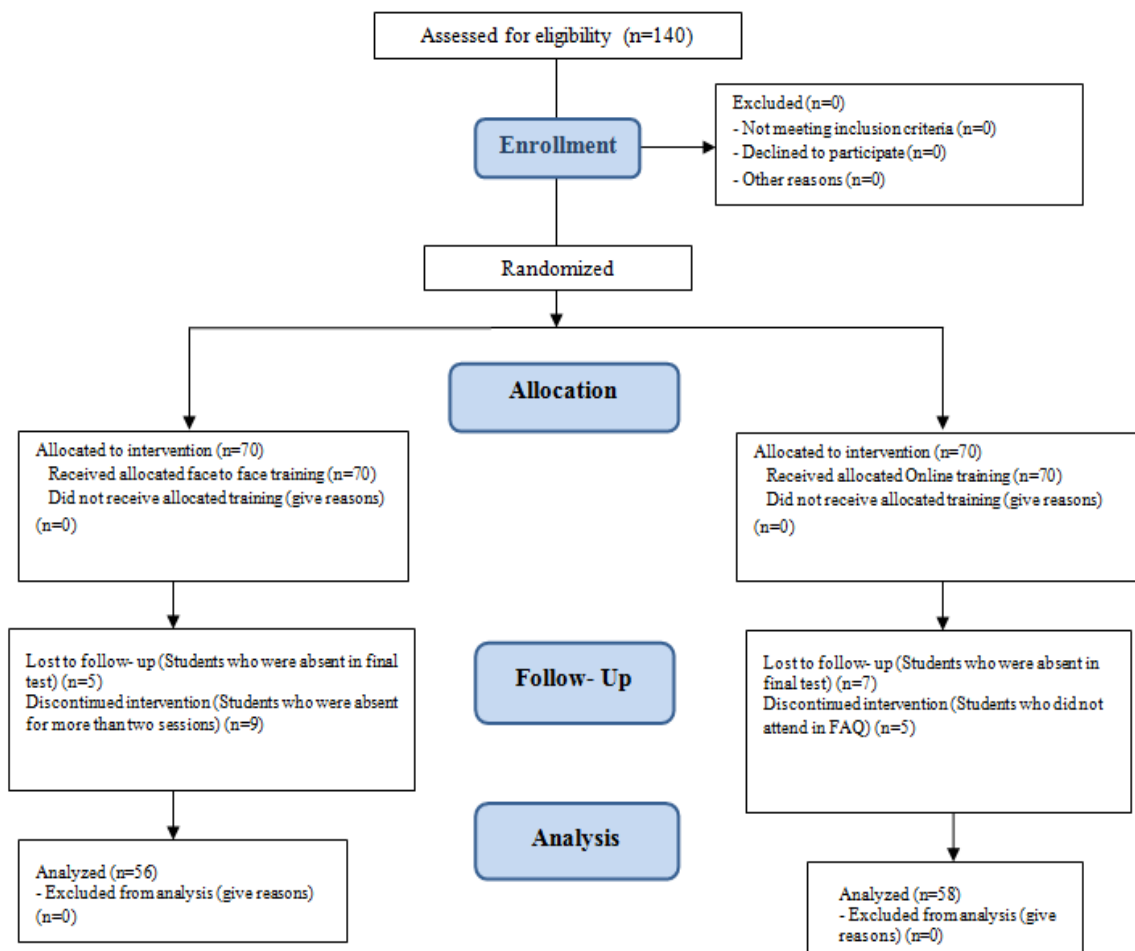

Figure 1: Study procedure

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RESULTS

In this study, in face to face class group 40 (71.4%) participants were female and 16 (28.6%) participants were male, with a mean age of 24.59±1.52 years and in online class 43 (74.1%) participants were female and 15 (25.9%) participants were male, with a mean age of 24.50±1.61 years while there is no difference between both groups in terms of age and sex (P value>0.05) (Also see Table 1).

Table 1: demographic characteristics of students in both groups

Characteristics	Face to face Training (n=56)	Online training (n=58)	P value
Gender			
Female	40(71.4%)	43(74.1%)	0.741
Male	16(28.6%)	15(25.9%)	
Age, year	24.59±1.52	24.50±1.61	0.760

Data are shown n(%) or Mean ± SD

The results from the score mean of practical skill in interpretation of ECG in both parts of diagnosis and interpretation indicate that the mean score of students before training in face to face class was equal to 12.3 ± 2.37 years and in online class was equal to 12.12 ± 2.06 years, it shows no significant difference between both groups (P value=0.148), therefore both groups at baseline are the same in terms of level of knowledge but after training, the mean score in face to face class group was equal to 16.53 ± 1.99 and in virtual group was equal to 16.56 ± 2.11, it was noted that the level of knowledge and skill in interpretation of ECG has been substantially and significantly increased (P value<0.001). But there was no significant difference between both groups in terms of increased level of knowledge and skill in interpretation of ECG after training (P value=0.668) (Table 2).

Table 2: Comparison of mean score of practical skill in interpretation of ECG in both groups of students

Score	face to face training (n=56)	Online training (n=58)	P value*
Pre test	12.3±2.37	12.12±2.06	0.148
Post test	16.53±1.99	16.56±2.11	0.668
P value**	<0.001	<0.001	

Data are shown Mean ± SD. *: level significant of comparing mean scores between two groups each of pretest and posttest, **: level significant of comparing mean scores between pretest and posttest in each of two groups

On the other hand, the frequency of correct answers in each parts of diagnosis and interpretation of ECG after training indicated that, in general, frequency percentage of correct answers in interpretation part was higher compared to diagnosis part, while both groups responded to tests, similarly, in both parts in terms of correct answers, therefore it suggests no significant difference between both groups in this regard (Figure 2).
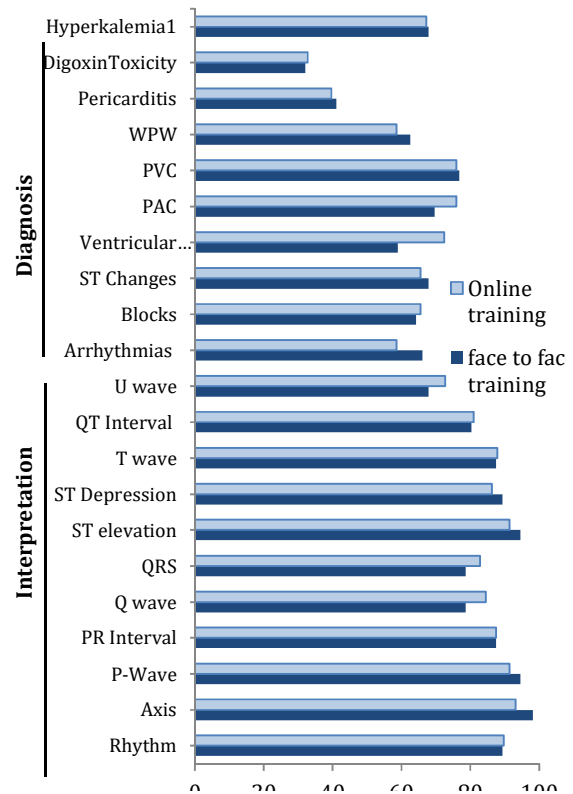

Figure 2: The Bar chart illustrating the frequency percentage of correct answers in both groups and in each parts of test including skill in diagnosis and interpretation of ECG

DISCUSSION

The pervasive nature of social media, is undeniable and indisputable anywhere in the world. The usage of many social media such as Facebook, Twitter, as well as instant messengers including Telegram Whatsapp and many other social networks has been confirmed in all aspects of life including health issues. Today, physicians, medical educators and students are applying these applications and sites as a portable medical

toolbox. Thus, these programs can be the next step in medical services technology [10-13].

This study included two groups of students in emergency medicine to compare the quality of interpretation and clinical diagnosis in both face to face and online training. The results of the comparison of these two groups at baseline showed similarities and commonalties between the two groups in terms of age and sex (P value>0.05). On one hand, in pre-test at baseline, the results suggested that students in both groups had no significant difference in terms of pre-knowledge in diagnosis and interpretation of ECG, which could be an advantage for the final result of test due to reducing the impact of confounding factors such as significant difference between both groups in terms of pre-knowledge in diagnosis and interpretation.

On the other hand, the results of final test after training by two mentioned methods showed that there was a significant increase in the knowledge and skill of students for diagnosis and interpretation of ECG (P value<0.05) but similar to pre-test, there was no significant difference between two groups in terms of final scores (P value>0.05). It could be interpreted that the use of virtual method like face to face method, may create a good and acceptable trend in individuals' learning and according to the significant difference, depicted in the results of final test between both groups regarding improvement in diagnosis and interpretation of ECG, online methods like face to face method can be applied as a training tool to transfer medical knowledge to students.

The use of web-based tools and methods has several advantages compared to print-based tools and face to face methods, providing a better and faster search , and encouraging students to interact more and easier in virtual environments [14]. In recent studies, e-training has been considered as a powerful factor as well as the face to face method to transfer knowledge [15-18]. In a prospective look, increased use of open source, accessible web-based tools can be regarded as an emerging trend in the field of medical sciences, and sometime it has been referred as Web 2.0 [19, 20]. McGee and Begg have defined Web 2.0 as a web-based set concentrated on a user and designed based on individuals activities to share the information on this set publicly. This is a team

work to create a system with a great content to be used as a scientific reference [21, 22].

In line with this study, in a study has been reported that there was no significant difference between two methods including face to face and virtual methods regarding scores of theoretical test of courses including triage, cardio-pulmonary resuscitation (CPR) and equipment and transfusion; in other words, abilities and skills of both groups were similar in theoretical subjects [23].

In general, studies in this field indicate a positive result of online training on the quality of medical students' learning in different places of the world. In a study in which a virtual customized online environment had been applied, through cooperation with students, scientific content uploaded and clinical issues were considered in the form of comments, suggestions and questions and in this environment which was similar to a weblog, the success of clinical interpretation had been observed abundantly [24]. Although the use of virtual environment as a training tool for medical students is due to being easy to write and possibility of the reflection of the different sciences preferred by students in it, other 25 studies showed that students for clinical diagnosis rather preferred to be physically present in the classroom or patient room so they can observe problems closely and practically [24].

Some studies on mix analyzes have concluded that success or improvement of students in clinical sciences, in the presence or absence of virtual networks is not much different [24, 26] although it has been shown that using clinical conversations in virtual environments had increased the mean scores of students who were active in these environments compared to those who were less active in these discussions [27]. A study, on classes taken advantage of virtual environments, showed that the feedbacks from students and the quality of what was written by students and scientific discussion in these classes had no difference compared to students who did not use virtual environments [28]. However, another study was conducted on students of a college, assessed the role of environment and online training on the reflection and behavior of educator and encouraging students, as an effective and useful role [26].

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The important point that in this discussion should be considered is exploring challenges and opportunities provided by the virtual environment in medical training. Many of studies stated the challenges of online training among medical students. For example, in some cases the attendance of students as well as the time required by courses is taken longer than the period was planned [27]. In addition, according to the privacy sending posts for some students seemed difficult, but this is easy to solve and security settings could be applied [29]. Also, reading all of comments by educators in an instant messenger like Telegram was exhausting, because some of answers could be unscientific [26].

Due to the lack of infrastructure and adequate funding sometimes medical schools are unable to provide basic facilities in the training environment [28] however, in this study we used public Telegram application which is free and available to everyone and almost on all of smart phones of students these days, and we solved mentioned problems about the lack of facilities among students. Another challenge we faced with was the lack of attendance and participation of students due to a lack of desire to online training. This issue also was reported in other studies, for example in a study of training in virtual environment, some of students were active while the others preferred not to attending in discussions and they just were reading others' messages [30].

In another study, 29% of students stated they would not read others messages and more than of 40% of them stated they have lost their interest during practicing and attending in online classes. It also announced by students that in the classes of problem solving and diagnosis and clinical interpretations, they have spent more time to learn compared to face-to-face classes [24].

On the other hand, the opportunities created in online training methods are considerable and extensive, that seems to be a way which can be used as an alternative to face to face classes. Many studies represented that the quality and value of this method in a practical and scientific progress has been impressive as well as encouraging students to take advantage of an attractive environment, available at any place and any time. In addition, the existence of sufficient flexibility in the virtual environment can meet all needs of students in this regard [27, 31]. Also, the existence of virtual networks can provide more accurate and

faster statistics on the performance of individuals during the training and scientific issues [29]. In general we can mention following advantages for the importance of social networks in medical training: more collaboration, professional development in an attractive and safe environment, creating jobs in the medical online training application for other people, better support of student learning, better access to resources and online information for medical educators and ultimately breaking down geographical barriers and creating an international training environment [32-38].

CONCLUSION

According to the results of this study, with respect to the similar impact that online methods have on medical education; the authors conclude that e-learning, as a flexible method provides the possibility of access to learning content at any time and any place for medical staff. Therefore, it is recommended that in addition to face to face training; online methods in combination of face to face training should be applied in training of medical sciences to enhance the quality of education.

Conflict of interest
 There is no conflict of interest in this study.

Author`s contribution
M.NI, and I.M, designed the study and prepared a draft of article. Both authors approved the final version of paper.

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