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A survey on the effect of educational software method of arrhythmias stimulator on the level of knowledge of electrocardiograms interpretation in nurses

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ABSTRACT

Aims: The aim of this study was to determinate the effect of educational software of arrhythmias simulator on ECG interpretation's knowledge among nurses who are working in intensive care units.

Methods: This quasi-experimental study conducted with participation of 73 ICU and CCU nurses from two Seyedoshohada and Taleghani hospitals of Urmia that were randomly placed in two groups; intervention and control. Data were gathered by a researcher-made questionnaire, which verified their validity and reliability and was consisted of 15 theoretical questions and 25 arrhythmia strips in the form of pretest-posttest design. The collected data were analyzed by SPSS statistical software (ver.16).

Results: The mean and standard deviation of the nurses' before and after scores, the group that used educational software of arrhythmia simulator method was 17.21±2.04 and 22.15±3.27 respectively, whereas it was 16.77±4.86 and 19.13±5.28 in the conference group, respectively. The Independent statistical T-test revealed a significant statistical difference between the post training scores in two groups (p=0/004). Also the comparison of average of scores in the form of intra- group with paired t-test revealed significant differences in before and after scores in every group (p<0/005). However, the mean difference between pre and post scores in the intervention group was higher.

Conlusion: The use of educational software of arrhythmias simulator causes more improvement of the knowledge of nurses in arrhythmias interpretation field. According to the results of this study, the ease of using and availability of simulator software, and it's application in wards can facilitate in-service training for staff, particularly nurses who are working in intensive care units and also enhance their knowledge and skills in the interpretation of electrocardiograms effectively.

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1. Introduction

Electrocardiogram (ECG) includes valuable information that is used for guiding clinical decisions for hospitalized patients.

This equipment is used in some circumstances such as Transient Myocardial Ischemia and cardiac arrhythmias as a golden standard for diagnosis and it has been ued instead of many advanced diagnostic tests [1, 2].

The importance of electrocardiogram from nursing point of view is since many abnormal cases that they can be detected in electrocardiogram (as the first diagnostic test), indicate the threatening danger of life that it can be pointed to Acute Coronary Syndrome (ACS) and dangerous arrhythmias such as Ventricular Tachycardia, Ventricular Fibrillation, Atrioventricular Blocks and sinus disorders [3-5]. Also some drugs that had been consumed in heart treatment-educational centers can lead to creation of exacerbation of arrhythmias [2].

These things can show the importance of electrocardiogram interpretation and monitoring in diagnosing heart disorders [2].So for providers, it is necessary to have competency in ECG interpretation and its learning [6], because this learning directly effects on diagnostic accuracy of the person and consequently its treatment [7]. Nurses are the first people who can play a key role in recognizing heart rhythm disorders, so correct reading of electrocardiogram is counted as their important competences and duties especially in intensive care units [1, 8].

Despite this, significance level has been observed through misdiagnosis of arrhythmias by nurses [9]. In one study, which had been done by Marion (2010) on nursing staff, it has been cleared that only 29.1% of the nurses interpreted ECG strips correctly, also nurses, who diagnosed Atrial Fibrillation and Atrial Flutter correctly in compare with Accelerated Janctional Rhythmia were 3.8% and nurses who diagnosed 2-Degree Block correctly in compare with Accelerated Janctional Rhythmia were 47.9% [10]. The reason of such weaknesses can be due to several things such as making electrocardiogram interpretation education specified to the period before graduation and forgetting interpretation knowledge by passing time and finally difference in educational programs and approaches, since it is possible that difference in ECG's educational programs effects on its interpretation [6].

There is great variety among ECG interpretation educational program [11]. Programs that includes a wide range of methods such as; conventional lecture, group education meetings, Online Module, observational interpretation, education methods at bedside, education based on computer and electronic methods [6].

Nowadays education at patient's bedside and lecture are the most common educational methods [12]. Also there are various studies about providing new methods of electrocardiogram education [12] that among these studies, it can be pointed to the case-based method in the studies of Counselman and Jeffrie, using stimulator in the study of Muller, web-based education in the study of Jang and Automated serial comparison in the stud of Gregg (11, 13-16). Also in some centers, other methods such as Problem-Based Learning (PBL) and other active learning methods have been used (13, 16).

Using new methods can cause better interpretation of ECG [12]. One of these methods is teaching by the help of the computer, and also among this, stimulator is the most interesting kind of learning by the computer and it lets the learner to play an important role in stimulating situations and conditions [17]. In addition to that, stimulator software is not expensive and risky as real environments; that it can be used in the education effectively [18].

Educational stimulators software as a technic can cause simplification and improvement of learning performance. Also using them can cause a lot effect on promotion of learning and remembering and consequently growth of

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educational quality [19]. Regarding this, some previous studies, achieved some results based on the positive effect of using educational software and stimulators on the improvement of learning quality in compare with the usual methods [16, 20, 21].

According to eyewitness observations of the researchers of the weakness of electrocardiogram interpretation knowledge in nurses and the necessity of using methods for its improvement on one hand, and it is likely that electrocardiography knowledge to be forgotten by pass of time [6], the importance of maintaining electrocardiogram interpretation skill after graduation [22], making a program about in-service education of nurses and measurement of the effect of new educational methods like using stimulator software based on having positive effect on learning in various educational fields in the above studies from the other hand made the researchers to do a research regarding promotion of nurses' capabilities with the aim of assessing the effect of using arrhythmias stimulator software on the improvement of electrocardiogram interpretation knowledge and skill in nursing staff, working in intensive units of Taleghani and Syedoshohada hospitals of Urmia.

2. Methods and materials

This was a quasi-experimental study with the pretest-posttest design that the effect of education on the level of ECG interpretation knowledge of nurses, working in intensive units had been studied by using arrhythmias stimulator educational software.

Samples of the study were 73 people of nursing staff of intensive units of Taleghani and Syedoshohada hospitals of Urmia, who were invited for participating in the study and the consent form of participating in the study had been taken from all of them. Also nurses participating in the study were free for continuing cooperation or withdrawing from the study.

Hospitals were randomly divided into two intervention and control ones for doing the study and so nurses of intensive care units of Seyedoshohada hospital were in intervention group and nurses of Taleghani hospital were in control group.

Before start of the study, one pretest had been done from all the nurses participating in the study. Then 39 of the nurses of Taleghani hospital were in control group and conference method (as a routine educational method of the hospitals) had been used for them for teaching electrocardiogram interpretation.

Also in intervention group, which had been included of 34 nurses of Syedoshohada hospital, self-directed learning by using ECG stimulator educational software had been used.

Data collection tools were a three-part researcher-made questionnaire that its first part was nurses' demographic questionnaire including; age, gender and work experience. The second part of the questionnaire included 15 theoretical questions about electrocardiogram interpretation principles and finally 25 electrocardiogram strips for interpretation were the content of the third questionnaire that for every correct answer to every strip, score 1 and for every wrong answer, zero had been considered.

Validity of the mentioned questionnaire had been confirmed through content validity and doing considered reforms of 10 specialists about electrocardiogram and its reliability through calculation of internal consistency and Chronbach's α correlation coefficient (α=0.78). arrhythmias stimulator educational software, which had been designed by Iran's cardiology nursing science society and its content was consisted of the form of arrhythmia, strips analysis, etiology, clinical signs and treatment of every one of junctional, atrial and sinus dysrhythmia, atrial-ventricular nodal blocks and ventral dysrhythmia had been given to the nurses of intervention group and necessary educations had been given to them about the way of using software.

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It had been asked from the nurses to study the content of this software and to use its other equipment, such as; ability of taking exam and its subsequent feedback, in order to observe his/her learning.

Also in control group, two workshops had been held with conference method for teaching and arrhythmia education. People of this group could ask their questions about educational texts and participate in the discussion actively. Also, after holding the course, educational sources had been given to the people of control group.

One month after the end of the course, posttest had been taken from the people of two groups.

In order to interpret data, SPSS software, version 16 had been used and descriptive (frequency, average and standard deviation) and analytical statistic (independent and paired-T test for assessing the difference of the average of the scores of two groups before and after intervention in two forms of inter-group and intra-group) had been used for analyzing data.

3. Results

Number of the participants in the study in the arrhythmia stimulator group was 34 nurses, working in ICU and CCU that among them 29 were female (85.3%) and 5 were male (14.7%).

Also the conference group included; 39 nurse of intensive units (83.3% of CCU staff and 16.7% of nurses of ICU) that all of them (100%) were female.

In stimulator group, the average and standard deviation of age and work experience of nurses were respectively (32.34±4, 8.70±3.51) and in conference group, it was respectively (31.15± 6.08, 7.51±6).

The result of statistical independent t-test did not show significant difference between the variable of age and work experience in the two groups. Also there was no significant difference between age and work experience of nurses with the type of education in none of the two groups ($p<0.005$).

Comparing the average and standard deviation of pretest scores in two stimulator and conference groups in statistical independent t-test for the groups did not show any significant difference ($p=0.612$). but after performing interventions in two groups and by comparing average and standard deviation of posttest scores, there was statistical significant difference in two groups ($p=0.004$). Table (1).

In comparing and analysis of the average of scores before and after intervention in inter-group form and by using statistical paired t-test, significant difference in knowledge and skill of the electrocardiogram interpretation in stimulator group has been observed ($p<0.001$).

Table (1): determining and comparing the level of knowledge of electrocardiogram interpretation before and after education in two groups by using statistical independent-t test

Group / Test	Stimulator group		Conference group		Average difference	T statistics	P-value
	average	Standard deviation	average	Standard deviation			
Pretest	17.21	2.04	16.77	4.86	0.437	0.511	0.612
Posttest	22.15	3.27	19.13	5.28	3.019	2.9734	0.004

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Also in conference group increase of scores in posttest in compare with the pretest of the same group indicates significant difference between them (p=0.003).

But the important point is that the difference in the division of average before and after intervention in arrhythmia stimulator group was more than conference group. Table (2).

4. Discussion

In the present study, in inter-group comparison and based on the existed division in before and after scores of every group, it has been observed that there is significant difference between posttest scores of every group in compare with pretest. It means that both intervention methods in this study had positive effect, regarding improvement knowledge and skill of electrocardiogram interpretation in nurses.

Also in comparing scores of both groups with each other and in the intra-groups form, it has been observed that there is no significant statistical difference in pretest, which indicate that the groups before the study had the same level of knowledge, but after doing interventions and in comparing posttest scores, there was significant difference between the average of the scores of the two groups in a way that amongst difference indicated more effect of dysrhythmia stimulator software on the level of electrocardiogram interpretation knowledge in compare with teaching with conference method.

Gheaelghas et.al (2008) in his study compared the effect of three lecture methods (teacher-centered), solving the problem and tutorial with computer on learning correct reading of cardiogram, they achieved that all the used methods such as; simulator software and common method led to statistical significant difference in score of the groups, which indicates their positive effect on learning electrocardiogram interpretation knowledge [17]. And regarding this, it is in consistent with the present study. But in comparing the used methods in Ghezelghash's study, the difference in the scores of the group, which had used computer stimulator method, was less than the two last methods (17) that regarding this, they are not in consistent with the result of our study.

Wolffe (2002) in his/her study achieved results in line with results of our study that in his/ her study, students who used stimulator had better performance in compare with the students who did not use that (21).

In consistent with the present study, there are also other studies, which indicate better effect of new educational methods in compare with the present methods of electrocardiogram interpretation education.

Using the stimulator, which has been assessed in the study of Muller et.al (2005), there was more effectiveness in increase of the level of

Table (2): comparing the level of electrocardiogram interpretation knowledge before and after education according to the group by using statistical paired-t test

group	number	Pre-test	Post-test	division	t statistics	P-value
Stimulator group	34	17.21±2.04	22.15±3.27	4.94±4.36	-6.605	<0.001
Conference group	39	16.77±4.86	19.13±5.28	2.35±4.55	-3.237	0.003

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participants' knowledge and their ability in interpreting arrhythmias.

Also intervention group, which used stimulator in compare with control group, which used the common lecture, had better assessment of designed educational period from the approach of linking theory with clinical situations [16].

In the empirical study of Omidifar et.al (2006), which had been done with the aim of determining the effect of teaching ECG reading and interpretation with workshop method including; theory sessions, work sessions in small groups, session of assessing clinical case through collected ECG strips from the hospital, question and answer sessions and practice in small groups in medical students and comparing that with the present educational system; statistical significant difference between posttest scores of intervention group and control group indicates efficiency of workshop method in teaching ECG principles and its priority in compare with the common method [12].

Also in the study of Baghaei and Rasouli (2012), which had been done with the aim of assessing the effect of web-based education on cognitive learning of nursing students of Urmia Medical Science University, researchers achieved that both used traditional and web-based education methods during the study, caused significant change in the scores of nursing students about diagnosing heart arrhythmias in compare with inter-group, which is in consistent with the results of our study, but in their study, there was no significant difference between posttest of two groups in compare with each other that regarding this, it is not in consistent with the results of the present study [23].

In a similar study, which had been done by Jang et.al (2005) and with the aim of assessing the effect of web-based education in compare with traditional lecture method on learning ECG in nursing students, results showed that although in pretest, knowledge about ECG in students of intervention group in compare with control group was significantly lower, after intervention, knowledge of ECG interpretation in students of intervention group was significantly higher than control group [11].

Correct reading of electrocardiogram is one of the prerequisites of recognizing heart disorders and preventing side effects of these disorders.

Nurses, working in intensive units, by considering their work conditions, need more ability in electrocardiogram interpretation in compare with other nurses, and so it is necessary for them to have permanent access to equipment in order to maintain their competency regarding this issue.

According to the results of this study, the applicable suggestion is that using this educational software on computer systems of hospital units especially intensive units can provide background of permanent using of that for maintaining and promoting knowledge and skill of ECG strips interpretation for nurses.

5. Conclusion

Considering the results of the study and based on the limitations related to the conference methods and face-to-face education such as; lack of time, shortage of experienced teacher and lack of complete participation of staff by considering their conditions and high volume of work, it can be concluded that in compare with conference method, stimulator educational software has this ability and priority that lead to the improvement of electrocardiogram interpretation skill and knowledge in nursing.

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