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The Effects of Educational Intervention on Simulation for Increasing the Ability of Medical Students for Managing Dysrhythmia

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ABSTRACT

Purpose: The present paper studies the effects of an educational intervention as presentation by simulation on increasing the ability of interns in managing Dysrhythmia and performing cardiopulmonary resuscitation (CPR)
Method: The present paper is studding the educational intervention on 120 interns working in the emergency department of Imam Hussein Educational Hospital. The interns were divided into two groups randomly. They were trained by two methods of showing slides and simulation. The material was the techniques of managing different types of Dysrhythmia which threaten the life such as performing CPR. The interns were tested after one month the course was finished. The tests were on subjects as interpreting Dysrhythmia, pharmacology of Dysrhythmia and clinical techniques. The data analysis was done by multivariate chi-square, t-test and logistic regression. The alpha was equal to 0.05 ($P<0.05$)
Results: The mean and standard deviation of pharmacology scores of the groups for the simulation group was 10.6±2.6 and for the slide presentation group was 0.7±2.4. ($P=0.03$)
Conclusion: The findings indicate that there is no significant difference in training the interns by presenting slides or simulation in the performance of interns while treating Dysrhythmia.
KEY WORDS: Medical Education, Simulation, Dysrhythmia

INTRODUCTION

Treating thru patients has direct relationships with the method of education. The medical team's skill in dealing with life threatening situations will lead to decreasing the rate of deaths (3-1). Arrhythmia and Dysrhythmia are two emergency situations which require the interns and the whole medical team to be highly skillful and knowledgeable. Arrhythmia and Dysrhythmia are quiet common among patients and mostly cause sudden cardiac deaths. American center for controlling and preventing diseases claims that the frequency of sudden cardiac death due to Dysrhythmia is 600,000 in a year and most patients experience heart attack for the first time (4). Therefore, improving the knowledge and skill of the physicians can decrease the death rate. Another factor that can play an important role in training interns is the application of new educational methods. The application of a method of education that would increase the interns' skill in the diagnosis and treating Dysrhythmia has always been important for medical education planners. Gradually, traditional methods of education were replaced by modern methods (6.5). The old methods of training are ineffective in transferring knowledge and skill or stabilizing the knowledge in the learners' mind. The findings of various researches indicate that almost all students of medicine pass their exams after their training courses: however, they are not able to apply this knowledge in clinical cases. (8.7). Furthermore, the science of medicine is developing so rapidly that the medical education of an intern will suffice for a short period of time. As a result, planning new methods of education are necessary.

Researchers have developed new educational methods to meet the modern needs .A method that establishes a dynamic relationship between the trainee and trainer and makes teaching and learning simultaneous can be more useful than lectures that are one-way educational method(9). One of two-way and dynamic training methods is simulation. Now days, technology has made the use of simulation possible in the field of medicine (15-10). In numerous articles, this method of training is introduced for teaching CPR and treating Dysrhythmia which is life threatening. This method is reported to satisfy the intern's needs and stabilize knowledge in their minds (20-16). A metaanalysis indicated that training via simulation is a powerful tool that is effective and economic in medical training. This study stated that simulation for teaching CPR, laparoscopy surgery, listening to cardio sound, placing homodialysis,

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catheter, thoracen thesis, and placing catheter in central veins is highly effective in comparison with the old methods of education (21). Simulation is in fact a tool or situation that provides a suitable condition for rendering the material and creates real emergent conditions so that the learners can get a good feedback from learners(9).

In emergency conditions, the sensitivity of time and legal issues play a vital role in treating critical Dysrhythmia; therefore, it is not possible to train the students in clinical conditions (23, 22). It seems that simulation is a suitable choice for training the interns for emergent conditions .The traditional methods of education show slides and there is no chance for practical training before visiting patients. In Iran, General physicians usually treat the patients in regions that lack the necessary facilities. This issue emphasizes the importance of suitable training for them. The present paper studies the effectiveness of using simulation for teaching the diagnosis and treatment of Dysrhythmia to the interns of emergency department in Imam Hussein Educational Hospital. The purpose was measuring the effectiveness of this method on raising the interns' awareness and internalizing the material.

METHOD

The present study is a semi-experimental research. It is a form of educational intervention for training 120 interns in Imam Hussein Hospital. The interns were divided into two groups randomly while they were I their first month of training. One group was trained by showing slides and the second one by simulation presentation. The inclusion criteria were all the interns who entered the emergency department. The exclusion criteria were non attendance in the classes of training Dysrhythmia, unwillingness for participating in the study or tests and no participation in internship education in the emergency department.

The strategy for determining the sample size was intervention research. The mean score of the students was compared in the two groups of slide-show and simulation presentation. According to preceding researches (24) β= 0.1 %90, α%95 and the least difference was %10 d=0.1 which are clinically significant. The sample population was consisted of 51 participants.

The material was the same for both groups. The only difference was the method of presentation. The simulation toll was a complete anatomical model that could create various arrhythmias on the monitor (as the trainer intended). It was possible to do revival procedures such as cardiac massage, difiberation, and ventilation on the model. The training was done in a session held from 8:30 to 10:30.

The material was the methods of diagnosis and curing life-threatening Dysrhythmia. The Dysrhythmia content included topics as: ventricular fibrillation (fin), course, supraventricular tachycardia, polymorohy ventricular tachycardia, atrial fibrillation, atrial block grades 1,2and 3, sinus bradicardia, asystole, differential diagnosis such as sinus tachycardia and sinus rhythm. Performing CPR for adults (ACLS) was also one of the topics in the content. These topics were chosen based on the American Heart Association guidelines. The instructor was an ER doctor. There was one month interval between the training sessions for both slide-show and simulation presentation groups before taking the test. The items in the test were the same for both groups. The items were divided in to three sections as follows: Section one) items on diagnosing Dysrhythmia based on Electro cardio Graph (ECG), Section two) Items on medicines used for treating Dysrhythmia, Section three) items on CPR. Each section consisted of 20 items. The interns had 90 min to answer the 60 items.

In the first section of test the intern was asked to analyze 20 colored ECGs and write the name of the type of Dysrhythmia in a blank. In the second and third section the interns were required to answer multiple choice items.

After finishing the training course the interns who were willing to participate in the study were required to provide some personal information as; age, sex, marital status, the length of internship (in month), whether they have passed education in the Heart and Internal department of the Hospital, whether they have passed CPR training course for adults, children and infants, the score obtained in basic course test, pre-intern test and the average grade of clinical courses.

The rater was a researcher who was not aware of the purposes and content of the study. In this way, the study was single blinded. Then the scores for each section of the test were computed separately, the knowledge of interns for diagnosing and treating Dysrhythmia was analyzed with regard to other variables.

The data was analyzed by SPSS20.0 and STATA 11.0. T-test was used for qualitative factors and chi-square and Fisher were applied for qualitative factors to see the variance in the two groups. Finally, for eliminating extraneous variables or cofactors a logistic multivariate regression was used. The significant factors of mono variant (t-test or chi-square) were analyzed again by regression. The mean of the population was used for categorizing the data 925, 26). In this categorization, the variables that were studied have been divided into two groups:1) below mean 2) above mean. The average grades of interns

in the basic course and clinical course tests were divided into 3 sub groups; 20-18, 17.9-15, 14.9-13. The grades of pre-intern course were considered as a forth category12.9-10. The α= 0.05. (P=0.05)

RESULTS

In the current experimental research, 120 interns were divided randomly into two 60-participant groups to be trained based on slide show and simulation presentation. 38 participants (63.3%) of the simulation- presentation group and 40 participants of slide-show group were female (*p*=.7). The standard deviation and mean age of simulation-presentation group and slide-show group were 24.8±.8 and 25.00±.9 respectively (p=.82). 48 (80.00%) participants in the simulation presentation group and 47 (78.3%) participants in the slide-show group were single (p=.7). However, the ratio of the participants in simulation presentation group who had passed adult CRR course was higher in comparison with the participants in the slide-show group (38.3%) (table. 1).

Table 1: demographic information of participants according to the educational model

P	Training with slide		Training with simulator		variable
	%	frequency	%	frequency	
					Age
0/36	%76/7	46	%83/3	50	24-25/9
	%23/3	14	%16/7	10	26-28
					sex
0/7	%36/7	40	%63/3	38	male
	%33/3	20	%36/7	22	female
					Marital status
0/82	%20/0	12	%80/0	48	single
	%21/7	13	%78/3	47	married
				Month after internship	
0/52	%1/7	1	%0/0	0	6<
	%20/0	12	%26/7	16	6-12
	%78/3	47	%73/3	44	13-18
					Elapsed course
0/99	%96/7	58	%96/7	58	Internal unit
0/77	45/0	27	%42/4	25	cardiology
0/85	%38/3	23	%36/7	22	pediatrics
0/25	%36/7	22	%46/7	28	CPR newborn
0/02*	%38/3	23	%60/0	36	Adult CPR

*significant differences (p<0.05)

The score of most interns' basic course (71.7%) in the simulation presentation and 61.7 in slide - show group) were in the range of 15-79; that is, the two groups were not significantly different in this respect (*p*=.51%). The clinical course average grades of the 25 (42.4%) interns trained with medical simulator and that of 27 (45.0%) interns trained with slide presentation was in the range of 13-14.9. The pre-internship score (36.7%) of most interns trained with simulator was within the range of 15-17.9 while 13-14.9 range was the most frequent score range obtained by the group trained with slide presentation (*p*=.02) (table. 2).

table 2: Scientific experience of participants according to the educational models

P	Training with slide		Training with simulator		variable
	%	frequency	%	frequency	
					Basic science score
0/51	%20/0	12	%15/0	9	18-20
	%61/7	37	%71/7	43	15-17/9
	%18/3	11	%13/3	8	13-14/9
					Clinical course score
0/85	%31/7	19	%33/3	20	18-20
	%10/0	6	%6/7	4	15-17/9
	%45/0	27	%42/4	25	13-14/9
					Pre-internship score
0/02*	%19/0	9	%20/0	12	18-20
	%28/3	17	%36/7	22	15-17/9
	%43/4	26	%28/3	17	13-14/9
	%13/3	8	%15/0	9	10-12/9

*significant differences(p<0.05)

Having trained the participants, the evaluations indicated that, except for the score of pharmacology, other trainings in the current study resulted in no significant difference between the two groups. The mean and standard deviation of pharmacological score in the simulation-based training group and slide -show group were 10.6±2.6 and 9.7±2.4 (p=.03). However, the mean and standard deviation scores obtained by the group who was taught with medical simulator regarding ECG interpretation, clinical function, and the three parts of the test (total score) were estimated as 13.6±3.1, 10.1±2.4, 34.5±6.4 respectively. These scores were also estimated as12.6±4.0, 9.8±3.0, and 32.0±7.4 respectively for the other group, the group which was taught with slide presentation. No significant differences were observed between the two groups' heart interpretation score, clinical function score, and total score (table. 3).

Table 3: the sores of participants according to the educational model

P	Training with slide	Training with simulator	score
			ECG
0/1	12/6 (4/0)	13/6 (3/1)	Mean(SD)
	11/5-13/6	12/8-14/4	CI%95
			Pharmacology
0/03*	9/7 (2/4)	10/6 (2/6)	Mean(SD)
	9/0-10/3	10/0-11/3	CI%95
			application
0/5	9/8 (3/0)	10/1 (2/4)	Mean(SD)
	9/0-10/7	9/5-10/7	CI%95
			Total score
0/051	32/0 (7/4)	34/5 (6/4)	Mean(SD)
	30/1-33/9	32/8-36/1	CI%95

*p<0.05
CI: confidence interval

Having investigated the influential factors responsible for pharmacology score (grade), it was revealed that the score of basic science (p=.02) and clinical mean (p=.0001) as well as educational method had a significant relationship with pharmacology score (grade). Thus, a multivariate regression model was used to investigate the independent factor which caused the increase in pharmacological score; the results of which indicated that the factor causing the observed significant difference in interns' pharmacological scores is the high clinical mean. This implies that the educational model adopted for the current study had no effect on the pharmacological score. As it is evident in table 4, the pharmacological score for Dysrhythmia treatment would be in a favorable level when the interns' clinical course average grades are within the ranges of 15-17-9 (OR=.0009, 95%CL, p=.009) and 18-20 (OR=.03, 95%CL, p=.009) which is the evidence to claim that there is a positive correlation between interns' clinical average grade and pharmacological score. This means that an increase in student's clinical average grade would lead to an increase in pharmacological score ($p_{\text{for linear trend}}$<.0001)

Table 4: factors influencing pharmacology score

P	Confidence interval %95	AOR[1]	Pharmacology score		variable
			≥median	<median	
					Training model
--	Ref	Ref	24 (%40/0)	36 (%60/0)	slide
0/16	0/24-1/27	0/55	33 (%55/0)	27 (%45/0)	simulator
					Basic science score
--	Ref	Ref	5 (%26/3)	14 (%73/7)	13-14/9
0/66	2-2/7	0/74	37 (%46/2)	43 (%53/8)	15-17/9
0/59	0/09-3/7	0/6	15 (%71/4)	6 (%28/6)	18-20
					Clinical course score
--	Ref	Ref	1 (%10/0)	9 (%90/0)	13-14/9
0/009*	0/08-0/7	0/24	28 (%39/4)	43 (%60/6)	15-17/9
0/009*	0/002-0/42	0/03	28 (%71/8)	11 (%28/2)	18-20
					Pre-internship score
--	Ref	Ref	7 (%41/2)	10 (%58/8)	10-12/9
0/91	0/3-3/7	1/1	21 (%48/8)	22 (%56/4)	13-14/9
0/38	0/48-6/7	1/8	17 (%43/6)	22 (%56/4)	15-17/9
0/38	0/4-10/05	2/0	12 (%57/1)	9 (%42/9)	18-20
				course CPR adult	
--	Ref	Ref	25 (%41/0)	36 (%59/0)	no
0/21	0/4-3/2	0/7	32 (%54/2)	27 (%45/8)	yes

[1]Adjusted Odd Ratio
*p<0.05

DISCUSSION

The current study findings indicate that there exists no significant relationship between efficiency in Dysrhythmia education and the methods chosen as simulation method and slide presentation method. This can be observed in almost similar scores the two groups obtained as total score, ECG interpretation score, and clinical function. Thus, it can be claimed that the adopted methods for interns' training do not have any significant effect on interns' competence (efficiency) in Dysrhythmia diagnosis and management. Although the Dysrhythmia pharmacology score was higher in simulation-based training group when mono variant analysis conducted (p=.02), conducting logistic regression showed no significant relationship between educational method and interns' competence (p=.16). These tests reveal that clinical course average grades is the factor that is responsible for pharmacological scores, that is, an increase in clinical average grades causes an increase in pharmacological scores.

Disregarding these two educational methods, the low scores of participants in Dysrhythmia diagnosis and management is surprising and worthy of attention. As it is evident in table 3, the mean and standard deviation of ECG interpretation, pharmacology, and clinical function of the interns trained with simulator method were 13.6±3.1, 10.6±2.6, 10.1±2.4 respectively which are very low since the total score was set as 20. It seems that these results are due to the weaknesses existing in education with respect to the inefficiency in educational structure, inappropriateness of teaching environment, educational system which is not considering the needs of society and interns as well as presenting a large bulk of information in a short time.

The structure of educational system; including attitudes, beliefs, programs, and manuals, can influence teaching method. Inflexible manuals, non-specialized decisions made behind closed doors, educational system's not considering interns' needs, and system's prioritizing the content rather than considering a comprehensive development, can influence educational activities such as teaching methods. Due to various reasons such as inefficient educational structure and educational system, inappropriateness of teaching environment, and lack of consistency between curriculum and needs of society and interns, the education system appears to be inefficient. Seemingly, serious revisions in educational system are needed. In the current study, it was observed that the educations related to Dysrhythmia were not efficient as it was expected. It seems that the taught issues, educational plans, teaching environment, and a great bulk of information to be learnt in a short time were the factors that influenced medical interns' inefficiency to diagnose Dysrhythmia and to decide on a right treatment quickly.

Compared to Waryneet al.'s study which reports that taught skills to the internal medicine ward's residents did not decrease after 14 months, the researchers of the current study found that simulation method causes maintenance of taught skills in respect to Dysrhythmia and cardiopulmonary resuscitation. In another study ,conducted by the same scholars, it was observed that the interns' scores increased by adopting simulator method to teach the required skills. Findings of Delasobera et al. also shows that teaching with a simulator is more efficient regarding maintenance and learning of ACLS skills than teaching with video and regular training methods. Hall et al. also have shown that teaching the skill of لوله گذاری تراشه دار with a human patient simulator is as efficient as practicing on a human being. Bruppacher et al. state that simulation-based training causes improvement in patient care after coronary bypass surgery. The scholars claim that, compared with traditional lecture courses, teaching skills based on the simulator causes improvement in patient treatment and care for those underwent coronary artery surgeries. However; Elley et al. have shown that although simulator presentation can improve consulting session, communication with patients, and managing patients; training in clinical conditions is more efficient in this respect. Gilbert et al. also reports that using the simulator to train fourth grade medical interns has no significant difference with lecture presentation.

Regarding the efficiency of simulation method to increase clinical skills, there is a debate between the scholars if the differences are due to the differences in educational systems or educational structures of the countries. Besides, methodological differences are factors that may cause the existed differences reported in the findings. However, it should be noted that most studies claim that there exists a significant relationship between simulator method and the increase in clinical skills of physicians and nurses and, thus, improvement in the services given to the patients in this respect.

The current study is the first research conducted in Iran which aimed to determine the efficiency of simulator method training to increase clinical skills of medical interns for Dysrhythmia diagnosis and management and comparing it with slide-show training efficiency. Besides, findings of the current study can be regarded as an evaluation of the medical interns' educational procedures regarding the Dysrhythmia. Based on the results of the current study, without considering the teaching method adopted, current education efficiency is not satisfactory because most interns’ scores were low. Therefore, it is suggested that responsible people in authority pay attention to this issue and plan to improve both the curriculum and conditions of training courses.

To count on short-term knowledge of practitioners is one of the limitations of the present study, since the results of some of the studies confirm the role of long-term stimulator training in maintaining the learnt knowledge. For this reason, it is suggested that the maintained efficiency of this training method in long-term be analyzed in the future researches.

CONCLUSION

The results and findings of the current study indicated that, compared to slide-show training, teaching with simulator method has no significant relationship with increasing and improving the knowledge and efficiency of interns in facing Dysrhythmia in emergency department. Besides, the results of the study revealed that medical interns are not competent enough in diagnosis and management of the patients in emergency department, which is a shortcoming and should be attended in the future by the responsible authorities in the educational system.

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