Brief Report

Comparison of Electronic Learning Versus Lecture-based Learning in Improving Emergency Medicine Residents' Knowledge About Mild Induced Hypothermia After Cardiac Arrest

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Abstract

Background: The process of medical education depends on several issues such as training materials, students, professors, educational fields, and the applied technologies. The current study aimed at comparing the impacts of e-learning and lecture-based learning of mild induced hypothermia (MIH) after cardiac arrest on the increase of knowledge among emergency medicine residents.

Methods: In a pre- and post-intervention study, MIH after cardiac arrest was taught to 44 emergency medicine residents. Residents were randomly divided into 2 groups. The first group included 21 participants (lecture-based learning) and the second had 23 participants (e-learning). A 19-item questionnaire with approved validity and reliability was employed as the pretest and posttest. Then, data were analyzed with SPSS software version 17.0.

Results: There was no statistically significant difference in terms of the learning method between the test scores of the 2 groups (P = 0.977).

Conclusions: E-learning and lecture-based learning methods was effective in augmentation of residents of emergency medicine knowledge about MIH after cardiac arrest; nevertheless, there was no significant difference between these mentioned methods.

Keywords: Education, Emergency Medicine, Hypothermia After Cardiac Arrest

1. Background

The total number of sudden cardiac arrests in population above 35 is 1 out of 1000 (1). It is estimated that about 10% are neurologically recoverable (severe brain damage due to hypoxic brain injury). Unfortunately, most of the cases who survive a cardiopulmonary resuscitation (CPR) need permanent medical care; otherwise, they develop cognitive and memory disorders. Although financial costs of oxygen deficiencies in brain is unknown, it is estimated to be in a high level (2). It is a big obstacle indeed to calculate the exact number of mortalities after sudden cardiac arrest. According to an investigation in the United States, about 250,000 death from sudden cardiac arrest outside hospitals reports annually, while the survival rate is only 6% (3).

Mild induced hypothermia (MIH) after cardiac arrest can tremendously improve patients' neurological outcome and subsequently augments their total survival rate.

More recently, guidelines by American Heart Association greatly emphasize post-cardiac arrest cares such as MIH. In the developed countries, MIH after cardiac arrest is a common procedure (4). The procedure includes a collection of methods aimed to reduce body temperature and metabolism to protect nervous system from hypoxic injury (2, 5-7).

A report from the American department of health and human services discuss that almost 300,000 cardiovascular mortalities every year. According to American heart association CPR guidelines, 20% to 30% of the cases with cardiac arrest can return to normal life (8). There are no exact statistics about successful rate of CPR in Iran, however, according to available studies 9.7% of medical staff are familiar with CPR guidelines (9).

The process of medical educations depends on several factors such as training materials, students, professors, educational fields, applied technologies, etc. E-learning

is one of the medical education methods. Researches demonstrated that the developed countries such as US, UK, China, Canada, and Australia are the pioneers of e-learning in medical education. One of the advantages of e-learning is the access to all people everywhere in different locations (9-12). In fact, educational officials always focus on the effectiveness of e-learning on augmentation of students' knowledge and attitudes (11). E-learning is a novel method in medical education. In recent years, its implementation in medical education systems is suggested and practiced. Departments of continuing Medical Education (CME) in Tabriz University of Medical Sciences, Tabriz, Iran, applied the method in some lessons. Due to this fact, the current study aimed at comparing the effect of e-learning and lecture-based learning on MIH after cardiac arrest on emergency medicine residents.

2. Methods

The current quasi-experimental study (pre-test, post-test) was conducted in October 2015 in Tabriz University of Medical Sciences, Department of Emergency Medicine. Study population included all emergency medicine residents in the department (n = 46). Inclusion criterion was being a resident of emergency medicine and the exclusion criteria were unwillingness to cooperate with the study and absence in the pre- or post-test (only one or both). The study objectives were explained to all participants and they signed written consent forms. Ethics committee of Tabriz University of Medical Sciences approved the study. The current study compared e-learning with the lecture-based learning. Therefore, residents were randomly divided into 2 groups of lecture-based learning and e-learning, each of 23 participants using random allocation software. Two of the participants in the lecture-based learning group withdraw from the study; hence, the total number of participant in this group was 21 and the total sample size set to 44. The pretest session was held for all participants. The multiple choice questions (MCQ) were designed according to the guidelines for hypothermia after cardiac arrest. Experts from medical scientific board of Tabriz University of Medical Sciences evaluated the face and content validity and their suggestions were considered. To demonstrate the reliability, Cronbach's alpha coefficient was used and the result was 85%. Questions 1 and 2 were designed based on background contents, 3, 13, 14, and 15 based on indications, 5, 4, 8, and 10 based on pathophysiology, 6, 7, 11, and 18 based on the side effects, 9 and 12 based on lab findings, and finally questions 16 and 19 based on the treatment contexts.

After the pretest, e-learning was adopted in group 1 (on CD) and lecture-based learning in group 2. A software con-taining the guidelines for the induced hypothermia after cardiac arrest was given to group 1. It included a background about induced hypothermia, a pathophysiology of neuronal damage after cardiac arrest, types of induced hypothermia, side effects, hypothermic patient management, induced hypothermia guidelines, and patients rewarming. Software manual was, then, explained to group 1. They had 2 weeks to study the CDs. Group 2 residents undertook a 6-hour oral presentation in 3 subsequent weeks (2 hours in a week) about the guidelines of MIH after cardiac arrest.

Data were analyzed with SPSS version 17.0. To describe data, descriptive statistics such as frequency, percentage, mean, and standard deviation (SD) were used. The Kolmogorov-Smirnov test was applied to insure the normality of data distribution. Chi-square test was used to compare the qualitative findings, and the quantitative data were analyzed by the paired t test and independent samples t test. P < 0.05 was considered significant.

3. Results

The current study was conducted on 44 emergency medicine residents of Tabriz University of Medical Sciences. Accordingly, 21 participants underwent lecture-based learning and 23 were allocated to the e-learning group. Out of which 52% were the 1st-year, 13% the 2nd-year, and 35% the 3rd-year students in the e-learning group; 24% were the 1st-year, 43% the 2nd-year, and 33% the 3rd-year students in the lecture-based learning group and there was no significant difference between the groups in terms of the study year (P = 0.065). Table 1 shows participants' scores in the 2 groups both in the pre- and post-tests. Here, the difference between the mean scores of the participants on both methods was statistically significant, but the difference was insignificant when comparing the mean scores between the groups (P = 0.977).

Table 1. Mean Score of Residents in the Study Groups in Pre- and Post-tests

Group	Mean $\pm$ SD	P Value	
Lecture-based learning			
Pre-test	7.67 $\pm$ 2.29	< 0.001	
Post-test	16.52 $\pm$ 1.54		
E-learning			0.977
Pre-test	8.04 $\pm$ 2.72	< 0.001	
Post-test	16.17 $\pm$ 1.58		

Questions were classified according to their type; questions 1 and 2 on background, 3, 13, 14, and 15 on indications,

5, 4, 8, and 10 on pathophysiology, 6, 7, 11, and 18 on effects, 9 and 12 on lab findings and finally, questions 16 and 19 on treatment contexts.

4. Discussion

In the current study, 100% of the participants were the emergency medicine residents of Tabriz University of Medical sciences, Tabriz, Iran. The research concluded that both e-learning and lecture-based learning methods were effective to increase the knowledge of emergency medicine residents about MIH after cardiac arrest. There was a significant difference between participants' scores in pretest and posttest. But, no significant difference was observed between the total scores in 2 methods.

Khoshbaten et al., concluded that both e-learning and lecture-based learning methods had the same results regarding the level of knowledge about CPR in general medicine students (interns) (11). The finding was in agreement with that of the current study. Delasobera et al., compared stimulation, multimedia, and common learning in teaching CPR advanced skills. They believed that multimedia technique was more effective and reliable (13). Romero et al., explained that the web-based learning method had a key role in teaching CPR to general practitioners (14). According to Ko et al., model students could better understand the advanced cardiac life support and were more satisfied (15). Moreover, Cook et al., showed that the web-based learning improved clinical skills, airway management, and ability to apply defibrillation and other CPR skills (16). Monsieurs et al., believed that although e-learning is fruitful in medical education, an alternative method should be applied to have better and improved clinical skills and performance (17). Perkins et al., also showed that educational intervention in advanced CPR based on e-learning cannot solely increase the education quality (18).

Several factors were effective in the disproportionate increase of knowledge among residents such as high volume of curriculum presentation in a short-time, lack of former knowledge and awareness about MIH after cardiac arrest, lack of practical skills, and being exhausted from emergency units working shifts. Emergency department in Tabriz University of Medical Sciences is newly established and that is a reason behind the lack of long-term follow-ups on the reliability of residents' knowledge. Other limitations of the current study were the small sample size and lack of hypothermia induction tools in the emergency department.

5. Conclusion

Therefore, it is suggested to integrate both lecture-based learning and e-learning methods as alternative educational techniques. Moreover, provisioning and support of more practical educations, and preparing tools for induced hypothermia and practical performance can play a pivotal role in augmentation of clinical skills among emergency medicine residents. Furthermore, holding planned retraining programs in exact intervals for specialists and general practitioners can help them to get more acquainted and increase their knowledge.

Footnotes

Authors' Contribution: All authors have read and approved the manuscript. Hassan Soleimanpour, Farzad Rahmani, Alireza Ala, Mehrad Naghizadeh Golzari and Hamid Reza Morteza Bagi, Data collection, literature review, and manuscript drafting; Maryam Soleimanpour and Robab Mehdizadeh Esfanjani, Study design and the statistical analysis

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