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Comparing the Effect of Lecture-Based Training and Basic Life Support Training Package on Cardiopulmonary Resuscitation Knowledge and Skill of Teachers

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Abstract

Background: Out-of-hospital cardiac arrest is the leading cause of death. learning of basic life support (BLS) skills is necessary for rapid management of cardiac arrest.
Objectives: The current study was conducted to compare the effect of BLS training package and lecture-based training on cardiopulmonary resuscitation (CPR) knowledge and skill of high school teachers.
Methods: In this quasi-experimental study with pretest-posttest design, 120 eligible school teachers (60 persons in each group) employed in high schools were selected through convenience sampling and were randomly allocated to two groups of lecture and BLS training package. The instruments were a demographic information form, a knowledge questionnaire, and a skill assessment checklist. The same educational content was presented to both groups designed based on the latest revised standard guidelines of American heart association (2010) and relevant books. In the lecture group, theoretical and practical education was performed. The package content included video and educational pamphlets. The data were analyzed using descriptive statistics, Chi-square test, independent sample t-test, and repeated measures ANOVA in SPSS19. Significance level of 0.05 was considered.
Results: Independent t-test showed that there was no significant difference between the two groups in pretest and posttest scores of knowledge, but there was a significant difference in recall score (P = 0.047). Results of t-test showed that there was no significant difference between the two groups in terms of pretest, posttest, and recall scores of skill, while the mean score was higher in the training package group than the lecture group (12.56 $\pm$ 3.97 vs. 11.19 $\pm$ 4.8 in recall stage).
Conclusions: The results indicated that both educational methods have the same impact on the knowledge and skill of CPR in high school teachers; thus, the training package can be used as a simple, suitable, and practical method instead of traditional educational methods.

Keywords: Lecture, Simulation Training, Knowledge, Skill, Cardiopulmonary Resuscitation

1. Background

Out-of-hospital cardiac arrest is the leading cause of death and neurological deficits in Europe (1). Annual prevalence of cardiac arrest is 40 to 60 cases per 100,000 populations. In USA, more than 166,000 cases were reported with out-of-hospital cardiac arrest (2). According to the world health organization, about 300,000 people die annually in Iran. It seems that many deaths are preventable by suitable and careful actions in emergency medical centers (3).

In this context, the sensitivity and responsibility of individuals who face these conditions are critical (3). If the resuscitation is performed quickly, it will save patients' lives in 40% - 60% of cases. Of course, the success of resuscitation depends on skill and practice of CPR team. These skills depend in turn on knowledge of persons who are at the bedside of injured patients (4).

The common issue of the majority of studies concerning the saving the patients' life is the lack of sufficient knowledge and skills of patients, their relatives, and nurses. Thus, these groups should learn topics related to resuscitation and pre-hospital activities and increase their skills (5). The effect of trained and skilled persons on positive outcomes of resuscitation has been proven and people with enough knowledge are being able to save the patient's life (4).

The ability to perform CPR involves the acquisition and consolidation of knowledge and performance on cognitive and motor skills of CPR. The ability to perform CPR during cardiac arrest is very vital and lifesaving (6, 7).

Devlin (1999), Heming et al. (2003), Moser and Coleman (1992), and Nagashima et al. (2003) concluded in their studies that some factors are effective in the improvement

of competence in performing of CPR; but the critical factor is training of this procedure (6-9). Pottle and Brant (2000) said that only education of BLS and ALS is effective in the success of these procedures and consequently in lifesaving procedures (10). Also, Phillips (2007) stated that the global standards consider BLS training course as a prerequisite for all the people (11).

According to evidence, cardiac arrest in children and adolescents may be due to inherited heart conditions, congenital heart disease, or acute heart problems. Many of these conditions are not detectable by routine screening in schools. Thus, cardiac arrest is the first sign of this problem (11).

The frequency of cardiac arrest is about 3 times higher among teachers and school personnel than students (11). Death of young students due to cardiac arrest arouses emotions in the family and society and increases the concern about the vulnerability of other school-aged children (12). Therefore, teachers and school personnel have responsibilities to physical health of students (13). For this purpose and for preparing teachers to meet the risky conditions in school, training of them is critical and important (12).

There is much evidence that proper training and performance of CPR have positive effects on short-term and long-term survival of cardiopulmonary arrest victims (10).

There are many educational methods that are available for educators to use in various conditions. In educational settings, explanatory methods are the most common for teaching the concepts and lessons. In these methods, teacher transfer information to learners through the print media and lecture (14).

Among educational methods, the lecture method is inevitable in some cases, because it is a suitable means to present basic information and transfer science and even is the most appropriate teaching method in some circumstances 15. But, this method also has disadvantages such as passive learning and it is not suitable for training practical skills and reinforcing mental skills in high levels of learning. Also, the students do not have enough time for thinking as a critical element in learning. Therefore, there is the possibility of early forgetfulness of topics in learners (15, 16).

According to documents, the BLS skills are incompletely learned (17); thus in recent decades, there is a need to revise the traditional methods of teaching and use modern, active, and student-centered learning methods. Therefore, the use of these methods has become more common in different fields including medical sciences. Student-centered approach is a flexible way in which the needs and abilities of students are considered (15).

Self-learning for CPR was proposed in 1976. In the CPR education, video-based training programs, self-training, or teacher-centered methods were defined and demonstrated promising results (18).

The use of training package is proposed following the emergence of new learning theories such as social learning theory and increased emphasis on learners' needs and application of tools and equipment in education. The training package is a set of nationally endorsed standards, qualifications, and guidelines which are used to recognize and assess the skills and knowledge of people who must perform effectively in workplace. The training package is a systematic collection that is composed of three parts of educational technology (software, hardware, and problem-solving process). The production and use of these packages are of operational measures in the successful implementation of the training program (19).

In 2005, a semi-interactive tutorial program using a 22-min video was designed by American heart association, which led to the acquisition of more skills compared to teacher-centered courses (20).

Although no teaching method is superior to other methods, when educational objectives are achievable with active involvement of students, these methods are preferred to passive methods (14).

Thus, given the importance of BLS learning for all members of society and increasing the number of literate persons in the community, providing a training package for BLS could be of great importance as an inexpensive and available method for education.

Given that a few studies have been conducted in order to determine the effectiveness of BLS training package in Iran, the current study was conducted to compare the effect of BLS training package (Video and pamphlet) and lecture-based training on cardiopulmonary resuscitation knowledge and skill of teachers.

2. Methods

This research was an interventional study with pretest-post-test design and two groups. Study population comprised high school teachers who were working in educational fields. The sample size was calculated according to previous studies (21) with the significance level of 5% and the power of 80%. The sample size of 44 persons in each group and 88 persons in total was calculated. Finally, to have greater certainty, 120 teachers were selected as study sample.

In this study, 120 eligible school teachers (60 in each group) employed in high schools were selected through convenience sampling and randomly allocated to two groups of lecture (n=60) and BLS training package (n = 60) using random number table. A sampling frame of the

names was constructed for the 120 selected teachers. Everyone was given a number in sequence from 1 to 120. Then, 60 numbers between 1 and 120 were extracted from the table of random number to form the BLS training package group. The remaining 60 teachers whose numbers were not picked up formed the lecture group.

Without looking closely at the table of random numbers, the researcher puts a finger down on the page and looks for the number closest to it. Then, the researcher moved his/her finger, right, left, up, or down. As the finger was moved, each number between 1 and 120 was accepted and any above 120 rejected.

Then, 13 and 12 persons were excluded in the next follow-up period from the lecture and training package group, respectively. Inclusion criteria included employment as a school teacher and not participating in similar workshops. Exclusion criteria were unwillingness to continue the study, lack of participation in one of the theoretical or practical training sessions, lack of participation in pretest or posttest sessions, and studying in related fields.

The instruments were a demographic information form, a knowledge questionnaire, and a skill assessment checklist. Knowledge questionnaire consisted of 20 questions. There are 4 answer choices for each question that assess the teachers' knowledge about cardiac arrest and its causes, preventive ways, and CPR. Each correct answer receives one point, whereas a "wrong answer" and "no response" receive 0 point. Maximum score was 20 and the minimum was 0. This questionnaire was made by Mansouri et al. in the school of nursing and midwifery in 2012. Its validity was confirmed by 5 faculty members of the school of nursing and midwifery. To determine its reliability, a pilot study was done on 36 students and then, Cronbach's alpha was reported as 0.82 that demonstrated a good internal consistency for the test (22). In the current study, reliability of questionnaire was confirmed through test-retest. This method was used to determine the consistency of the test by administering the test to the same 10 teachers after a 10-day interval and r = 0.86 was reported.

The skills assessment checklist was prepared based on the latest revised standard guidelines of American heart association in 2010. This checklist contains 3 general parts and 22 minor parts. The 8 general parts contain some topics such as asking for help, checking carotid pulse, determining correct location of the hands, checking patient's response, doing cardiac massage, opening the airway, breathing patient, and observing the order of resuscitation process.

In case of the correct way of doing skill, the subject received score 1 and in case of the wrong way or incomplete skill, he/she received score 0. The maximum score was 22 and the minimum was 0. The validity of the checklist was confirmed by 5 faculty members of the school of nursing and midwifery (22). For reliability, inter-rater reliability was used and the correlation coefficient of two observers was calculated as 0.93.

After obtaining required permits, the 120 teachers who were willingness to participate in the study were selected through convenience sampling and then randomly allocated through random number table to two 60-person groups. After contact and coordination with the teachers, a briefing session was held for each group separately. After explaining the aim of the study and the study procedure by the researcher, all of the teachers signed a consent form regarding participation in the study.

Educational content for both groups was the same designed based on the latest revised standard guidelines of American heart association (2010) and relevant books. The package content consisted of video and educational pamphlets. The video was made in 2009 by the deputy head of treatment in Shiraz University of Medical Sciences. This 30-min video along with 4 pamphlets in the form of training package was available for the training package group. The package was used after making necessary amendments in accordance with the latest guidelines of American heart association in 2010 that was approved by the deputy head of Treatment in Shiraz University of Medical Sciences.

The educational content in both groups was the same and consisted of anatomy and physiology of heart and respiratory system, definition of cardiac arrest, the importance of CPR, the stages of BLS, diagnosis of cardiac arrest, the causes of airway obstruction, and symptoms/interventions in airway obstruction. In addition, how to check responsiveness and alertness in injured person, the correct way of putting injured person in proper position to begin CPR, how to check carotid pulse and respiration of patient, determination of the correct location of hands to begin CPR, determining the appropriate position of helper's body against the patient's body, determining at least 100 chest compressions per minute as the minimum number of chest compressions, determining the minimum depth of at least 2 cm in cardiac massage, determining the ratio of 30: 2 as the ratio of chest compressions to rescue breaths, performing Heimlich maneuver, and performing finger sweep to remove the foreign body were considered in educational content (23).

In the lecture group, the theoretical and practical pretests were done in the first day and before the intervention and then, the intervention was conducted in two consecutive days. The 3-h theoretical education was offered (similar to the training package group) and in the next day, the practical training was presented to the teachers through application of Moulage of Laerdal company of Norway.

In the training package group, after conducting pretest using the knowledge questionnaire and the skill checklist, training packages were available to the teachers. In the two groups, knowledge and skill of teachers were measured through a knowledge-based 21-question questionnaire and a skill-based 22-question checklist in time points of 2 and 6 weeks after the intervention.

The data were analyzed using descriptive statistics, Chi-square test, independent sample t-test, and repeated measures ANOVA in SPSS version19 software. At first, the Kolmogorov–Smirnov test was used to check the normality of the data. Since more than two measures were taken about knowledge and skill, repeated measures ANOVA was used. Chi-square test was used to determine a significant relationship between two categorical variables such as marital status and gender in the two groups. Also, for comparing some variables such as age and work experience, independent sample t-test was used. Statistical significance for analysis was set at $P < 0.05$.

The current study was approved by the ethics committee of Shiraz University of Medical Sciences (Iran, code CT9377-7277) in 2014. Ethical considerations were observed including getting permission from managers, obtaining informed consent, confidentiality of information, and withdrawal from the study at will. Also, the results of the study were given also to the teachers.

3. Results

In this study, 60 teachers in the lecture group and 60 teachers in the training package group were selected and then, 13 and 12 persons were excluded in the next follow-up period from the lecture and training package groups, respectively. No statistically significant difference was observed between the two groups in terms of age, work experience, gender, and marital status (Table 1).

The mean scores of knowledge in the training package group in pretest, posttest, and recall test were 5.44 ± 1.86, 14.48 ± 3.31, and 11.96 ± 3.68, respectively, while the corresponding mean scores for the lecture group were 5.94 ± 1.67, 15.04 ± 1.97, and 10.6 ± 2.86, respectively (Table 2).

After the intervention, the mean scores in posttest increased in both the groups. The increase of the scores was higher in the lecture group than the training package group although independent sample t-test showed no significant between-group difference in the mean scores of the posttest.

Also, the result of repeated measures ANOVA showed significant changes in the knowledge score in the three measurements ($P < 0.0001$) indicating the effectiveness of the two educational methods on knowledge of teachers. However, these changes were not significant between the two groups ($P = 0.153$).

The interaction between different time points of measurement and groups was not significant. In other words, the results showed that these changes overtime have no differences between the two groups. The increase of learning scores in the training package group was not significant compared to the lecture group and both methods could increase the knowledge score of teachers ($P = 0.34$) (Table 3).

The mean scores of skill in the training package group in pretest, posttest, and recall test were 2.9 ± 2.3, 17.54 ± 4.11, and 12.56 ± 3.97, respectively, while the corresponding mean scores for the lecture group were 2.66 ± 1.78, 18.43 ± 2.22, and 11.19 ± 4.8, respectively (Table 2).

Also, the result of repeated measures ANOVA showed significant changes in the skill scores in the three measurements ($P < 0.0001$) indicating the effectiveness of the two educational methods in the skill scores of teachers. However, these changes were not significant between the two groups ($P = 0.172$).

The interaction between different time points of measurement and groups was not significant. In other words, the results showed that these changes overtime have no differences between the two groups. The increase of the skill scores in the training package group was not significant compared to the lecture group and both methods could increase the sill scores of teachers ($P = 0.63$) (Table 3).

4. Discussion

The aim of the current study was to compare the effect of BLS training package (video and pamphlet) and lecture-based training on cardiopulmonary resuscitation knowledge and skill of teachers. According to the results, the two groups did not have significant differences in terms of age, gender, work experience, and marital status.

The results also showed that both the educational methods could increase the score of knowledge on CPR in teachers, but this increase was not significant between the two groups as well as at the three time points of measurement. These results are similar to results obtained by Khoashrang et al. (2007), Davari et al. (2006), Seraj and Naquib (1990) that demonstrated the effect of education on increasing knowledge about CPR among their participants (24-26).

Moreover, many researches showed the effectiveness of training package in the increase of learners' knowledge in different educational topics. The study by Nasiri et al. (2013) showed the effectiveness of malaria control training package in the increase of cognitive skills of doctors (27).

Table 1. Demographic Characteristics of Teachers in the Two Groups

Variable		Group		P Value
		Lecture	Training Package	
	Age	35.55 ± 6.32	34.67 ± 5.32	0.457
	Work experience	10.94 ± 6.4	9.4 ± 5.4	0.225
Marital status	Single	6 (13)	10 (10.2)	0.427
	Married	41 (87)	88 (89.8)	
Gender	Female	13 (27.7)	19 (39.6)	0.219
	Male	29 (60.4)	34 (72.3)	

Table 2. The Mean and Standard Deviation of Knowledge and Skill Scores in the Two Groups at Three Time Points of Measurement

Variable	Assessment Time	Group	Number	Mean ± SD
Knowledge	Pretest	Training package	48	5.44 ± 1.86
		Lecture	47	5.94 ± 1.67
	Posttest	Training package	48	14.48 ± 3.31
		Lecture	47	15.04 ± 1.97
	Recall	Training package	48	11.96 ± 3.68
		Lecture	47	10.6 ± 2.86
Skill	Pretest	Training package	48	2.9 ± 2.3
		Lecture	47	2.66 ± 1.78
	Posttest	Training package	48	17.54 ± 4.11
		Lecture	47	18.43 ± 2.22
	Recall	Training package	48	12.56 ± 3.97
		Lecture	47	11.19 ± 4.8

Table 3. The Repeated Measures Analysis of Variance for Knowledge and Skill Scores in the Three Time Points of Measurement Before and After Education in the Two Groups

	Factor	SS	df	MS	F	P Value	Eta squared
Knowledge	Three time points of measurement	342.89	2	132.89	70.18	0.0001	0.599
	Group	10.28	1	10.28	2.10	0.153	0.043
	Interaction	11.32	1	11.32	1.09	0.34	0.023
Skill	Three time points of measurement	432.36	2	176.45	54.18	0.0001	0.506
	Group	17.78	1	7.25	5.10	0.172	0.305
	Interaction	19.64	1	9.46	1.43	0.63	0.015

In a study by Majlesi et al. (2010), the both methods of lecture and training package showed the same effectiveness in increasing knowledge of teenage girls on puberty that is similar to the current study (28). However, in the study by Khakbazan et al. (2008), results showed that the effect of training package was more than the effect of lecture method on increasing the girls' knowledge about adolescence health (29).

The results also showed that both educational methods could increase the skill score on CPR in teachers, but this increase was not significant between the two groups as well as at the three time points of measurement. This means that the two educational methods are effective in increasing skill scores. The results of a study by Seraj and Naquib (1990) demonstrated that the practical knowledge of learners increased that is in agreement with our results

(26).

Also, the results of a study by Aghajanloo et al. (2010) is in line with our results. In their study, students' skills increased after resuscitation education (30). In a study conducted by Davari et al. (2006), results demonstrated that cardiopulmonary resuscitation training to high school students in the third year increased their performance concerning CPR (25). In the study by Xu et al. (2014) on the effect of training package of infant CPR on performance of health care team, results showed that the training package was effective in their performance (31). Moreover, in a study by Lynch et al. (2005) about the effect of 30-min CPR self-instruction program for lay responders, results showed that this program made learning basic cardiopulmonary resuscitation skills in subjects recruited from public sites (20).

In the current study, the recall scores of knowledge and skill in the training package group were higher than the scores of the lecture group. This means that this method is more likely to impose positive effects on recalling the learned content. In a study by Braslow et al. (1997) about CPR training without instructor, results demonstrated the better performance of video-training group compared to the traditional education in cardiopulmonary resuscitation (32). Also, in a study by Chung et al. (2010), video self-instruction and traditional classroom instruction targeting cardiopulmonary resuscitation skills of laypersons showed the same effectiveness (33). In the study of Monjamed et al. (2006), results showed the same effect for two teaching methods of CPR (Manikin and video) on knowledge and performance of nursing students (34).

The majority of surveyed studies confirmed the results of the current study. In other words, both methods were effective in the improvement of knowledge and skill of teachers concerning CPR. Some differences in the results of the current study with those of other studies may be due to differences in topic and educational content as well as in learners.

4.1. Conclusions

According to the results, both educational methods had the same effectiveness in the improvement of knowledge and skill of teachers concerning CPR. Therefore, given the importance of training package as a self-learning method that requires no teacher, it can be used as a simple, suitable, and practical method instead of traditional educational methods for CPR learning. This method can be a proper approach of CPR training for teachers and other educated strata of society. Thus, based on the results, health system managers should consider the application of these methods in their program.

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Footnotes

Conflict of Interest: We confirmed that the views expressed in our submitted article are our own and not an official position of the institution or funder.

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Implications for Health Policy Makers / Practice / Research / Medical Education: Training package can be used as a simple, suitable, and practical method instead of traditional educational methods for CPR training. This method can be a proper approach of CPR training for teachers and other educated strata of society.

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