

# The Effect of Scenario-based and Participatory Method of Cardiopulmonary Resuscitation (CPR) Training on the Knowledge of Basic and Advanced Life Support (BLS and ACLS) in Emergency Medical Technicians

Hossein Jafarizadeh<sup>1</sup>, Yaser Moradi<sup>2</sup>, Javad Rasouli<sup>3</sup>, Sona Zeinalzadeh<sup>4</sup>

*1Lecture, 2Assistant Professor, Patient Safety Research Center, 3Assistant Professor, Department of Epidemiology and biostatistics, School of Medicine, 4M.Sc. Student, Nursing and Midwifery School, Urmia University of Medical Sciences, Urmia, Iran*

## Abstract

**Background:** Despite running various training courses on cardiopulmonary resuscitation, emergency medical technicians are still facing problems with insufficient knowledge to play a professional role in management of CPR. Meanwhile, factors such as inefficiency of training method can have a detrimental effect on their learning, and eventually their knowledge and skills in CPR.

**Objective:** The present study aimed to determine and compare the effect of scenario-based and participatory method of cardiopulmonary resuscitation training on the knowledge of basic and advanced life support in emergency medical technicians.

**Methodology and Participants:** A total of 90 emergency medical technicians participated in the present quasi-experimental study (in three intervention groups of scenario-based, participatory and control). Block randomization was utilized to allocate the participants to three intervention groups. A researcher-made test including two sections of knowledge of basic and advanced life support (each one comprised 19 questions) was used to collect data. All statistical analyzes were conducted using SPSS software version 16.0 (SPSS Inc., Chicago, Ill., USA). The measure of central tendency and the Index of dispersion (mean and standard deviation) were used to analyze the quantitative data and Kruskal-Wallis  $H$  test was used to compare mean scores. A  $P$  value of less than 0.05 was considered statistically significant.

**Results:** The difference in knowledge mean scores of basic and advanced life support before the intervention was not statistically significant between the three groups ( $P > 0.05$ ). However, the difference was significant between the three groups after the intervention ( $P < 0.05$ ).

**Conclusion:** Based on the results of our study, scenario-based training method has a significant effect on improving the basic and advanced knowledge of CPR in emergency medical technicians compared to participatory method.

**Keywords:** *Cardiopulmonary resuscitation, Emergency medical technicians, Participatory method, Scenario-based training.*

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## Corresponding Author:

**Sona Zeinalzadeh**

M.Sc. Student, nursing and midwifery school, Urmia University of Medical Sciences, Urmia, Iran  
e-mail: sonazeinalzadeh2@gmail.com

## Introduction

Cardiac arrest is undoubtedly one of the cases that require immediate action to preserve life and prevent irreversible damage to the body's vital systems<sup>1</sup>. Based on the studies in Iran, a mortality rate after CPR exceeds

90%<sup>2</sup>. CPR can play an important role in preventing death by as much as 25%. CPR quality is an important determinant of cardiac arrest outcome and resuscitation success and survival rate<sup>3, 4</sup>.

The most important determinant of the chance of survival of sudden cardiopulmonary arrest is the presence of specialists in the early moments of an accident<sup>5,6</sup>. Therefore, emergency medical technicians have a crucial role to play in strengthening the survival chain and reducing mortality and improving recovery in these patients<sup>7</sup>. It is imperative for emergency medical technicians to have sufficient knowledge and skills in cardiopulmonary resuscitation in order to preserve patients' lives<sup>8,9</sup>. The results of previous studies indicate that despite running various training courses on CPR, emergency medical technicians are still facing problems with insufficient knowledge to play a professional role in management of CPR<sup>10, 11</sup>. Meanwhile, factors such as inefficiency of training method can have a detrimental effect on learning in these staff, and eventually their level of knowledge and skills in CPR<sup>12</sup>. Therefore, it is necessary to carefully and accurately select the applicable training strategies so that their learning causes more effective performance in real cases through increasing their knowledge<sup>13</sup>. Despite many advances in training method, traditional method such as lecture and booklet are still dominant in all disciplines<sup>5</sup>. In this regard, using active teaching method such as participatory and scenario-based method have been known as effective ways to promote health staff learning<sup>7</sup>. Participatory learning is kind of social learning in which participants interact with each other and learning happens<sup>14, 15</sup>. On the other hand, scenario-based training is a new approach that relies on the active participation of the learners, and attempts to help people through discussion, problem solving as well as employing their abilities and creativity as they would be able to develop their skills<sup>16, 17</sup>. Regarding the importance of the role and performance of emergency medical technicians in exposure to patients with cardiopulmonary arrest as well as the limited number of studies on the effect of scenario-based and participatory training method and comparing them with the control group, the present study aimed to determine and compare the effect of scenario-based and participatory method of cardiopulmonary resuscitation training on the knowledge of basic and advanced life support in emergency medical technicians.

## Methodology

**Design:** This is a quasi-experimental study with a nonequivalent pretest-posttest design. The minimum sample size for each group was calculated to be<sup>25</sup> using the corresponding formula ( $X_1 = 12.38$ ,  $X_2 = 10.92$ ,  $S_1 = 1.85$ ,  $S_2 = 1.79$ ) and the results of Babanazari et al. study 18 with a confidence interval of 0.95 ( $Z_1 - \alpha/2 = 0.96$ ) and a test power of 0.80 ( $Z_1 - \beta = 0.85$ ). Considering the sample attrition of 20% for each group, final sample size was considered 30 for each group so that a total of 90 emergency medical technicians were enrolled in the study. Block randomization was utilized to evenly allocate participants to three groups and avoid imbalance at any point of the randomization process. First, 6 blocks were created based on SSPPLL combination and then 90 codes were extracted and listed from. A code was assigned for each combination. Given the sample size of 90 and block size of 6, it required 15 blocks that were randomly selected from 90 codes and allocation was conducted based on the participants list extracted. Exclusion criteria consisted of unwillingness to continue participation in the study and the change in workplace.

A researcher-made test including two sections of knowledge of basic and advanced life support (each one comprised 19 questions) was used to collect data. Content validity was used to determine the tool validity so that the tool was given to five experts in the field of CPR. Subsequently, necessary corrections were made after receiving their feedbacks. Moreover, the internal correlation coefficient of 0.83 ( $r = 0.83$ ) confirmed the reliability of the data collection tool. In the participatory intervention method, the participants were divided into heterogeneous groups of 6 to 10 individuals. The training material was presented at the same session to the groups. In each group, the training content was divided into smaller sections and each member studied a section. Information on the subject was collected by each learner to review and study. The researcher also answered the participants' questions during this process, and directed them to the correct answers. At the final stage, a representative was selected by the researcher from each group to present the lessons learned and the findings as a group task to the class. At the end of the session, the researcher summarized the materials and provided further explanation. In the scenario-based intervention group, the technicians were also divided into groups of 6 to 10 and each group was given a

sheet to work out a specific scenario (CPR) using their experiences and the information received from the training session. Eventually, through summing up the most appropriate scientific and practical action and implementing them as teamwork, they wrote down their answers and a representative presented solutions and the most principled action with regard to the scenario to the audience in order to discuss it. The training sessions in each group were four two-hour sessions for one month. The control group did not receive any intervention. Two month after completion of the training sessions, follow-up was conducted through taking a post-test from the intervention groups. The educational content was selected and presented to the groups based on the standard headings and the main educational textbooks.

**Statistical Analysis:** All statistical analyzes were conducted using SPSS software version 16.0 (SPSS Inc., Chicago, Ill., USA). The measure of central tendency and the Index of dispersion (mean and standard deviation) were used to analyze the quantitative data and Kruskal-Wallis *H* test was used to compare mean scores. A *P* value of less than 0.05 was considered statistically significant.

**Ethical Considerations:** Prior to the beginning of the study, ethical approval was obtained from the vice-

chancellor of research and ethics committee of Urmia University of Medical Sciences with ethics number of IR.UMSU.REC.1397.399. Subsequently, the researcher first referred to the Urmia EMS center and received permission from the authorities to conduct the study and begun to collect data as mentioned before. The written informed consent was obtained from all participants and full explanation of study objective and design was provided. Moreover, all participants were assured that their personal information would be regarded as strictly confidential and only the statistical results would be published.

**Results**

The mean ages of the participants in the participatory, scenario-based and control groups were 29.50±5.94, 29.80±5.80 and 28.23±4.76, respectively. Based on the results, there was no statistically significant difference between the three groups in the mean scores of the knowledge of basic and advanced life support before the intervention. However, the mean score increased significantly in the scenario-based intervention group compared to the other two groups after the intervention (Tables 2 and 1).

**Table 1: Mean and standard deviation of the knowledge of basic and advanced cardiac life support (BLS and ACLS) in the three groups.**

Knowledge	Group	Participatory	Scenario-based	Control
		Mean ± SD	Mean ± SD	Mean ± SD
Knowledge of BLS	Before	10±1.46	9.60±2.12	9.73±1.98
	After	9.90±2.45	14.73±1.11	8.56±1.69
Knowledge of ACLS	Before	7±1.66	7.13±2.04	6.96±1.73
	After	7.50±1.30	12.50±0.90	6.36±2.07

**Table 2: Comparison of the mean and standard deviation of the knowledge of BLS and ACLS in the three groups.**

Knowledge	Group	Participatory	Scenario	Control	Kruskal-Wallis H test
		Mean rank	Mean rank	Mean rank	
Knowledge of BLS	Before	46.98	44.5	45.02	P=0.922
	After	36.43	74.62	25.45	P=0.001
Knowledge of ACLS	Before	45.18	47.05	44.27	P=0.913
	After	36.12	75.43	24.95	P=0.001

## Discussion

Cardiac arrest is undoubtedly one of the cases which requires immediate action to preserve life and prevent irreversible damage to the body's vital systems. The results of our study showed that there was no significant difference in mean score of the knowledge of BLS and ACLS between the three groups before the intervention, although the difference was statistically significant after the intervention. Generally, the mean scores of the knowledge of BLS and ACLS in the scenario-based intervention group were significantly more than in participatory and control groups. The results of Govender et al. (2015) study on comparison of two training programmes (traditional and tailored) on paramedic-delivered CPR performance, showed that paramedics who received CPR training with the tailored programme had significant higher mean scores than those who received the traditional programme. The results of this study showed that in an out-of-hospital cardiac arrest scenario, the CPR performance of paramedics who received the tailored programme was significantly greater<sup>12</sup>. In another study by Salehi et al. (2016) on the effect of cardiopulmonary resuscitation education through compound method on knowledge and performance of entourages of patients with cardiovascular diseases, a researcher-made questionnaire was used as a data collection tool and completed once in the first 72 hours of admission to the hospital and once again 2 weeks after the intervention. The education was provided in 3 sessions of 60 minutes on 3 consecutive days through lecture, practice on medical moulage, and group discussion. The results of their study indicated that compound education could be effective on awareness and performance of entourages of patients with cardiovascular diseases<sup>19</sup>. In a study by Liaw et al. (2010), the results demonstrated that the mean scores of crisis management performance for students who were received scenario-based training were significantly higher than the others<sup>20</sup>. Anderson et al. (2010) showed that participants who received CPR training monthly delivered a greater performance in terms of cardiac massage compared to other groups<sup>21</sup>. Regarding the reason for this, it can be assumed that in actual fact, scenario building, as it is close to reality, causes a learner to adapt him/herself to the conditions that are likely to occur. Therefore, it can lead to better performance.

## Conclusion

Based on the results of our study, scenario-based training method has a significant impact on the knowledge of basic and advanced cardiac life support in emergency medical technicians. It is strongly recommended that this method of training should be studied in further cohort studies and in case of achieving same results, fundamental training method should be used in the country's EMS (Emergency Medical Services) system and related courses.

**Acknowledgments:** This study is based on medical-surgical nursing master's thesis in Urmia University of Medical Sciences. We express our gratitude to the vice-chancellor of research affairs for their full support, the Urmia EMS center authorities and the participants as well.

**Conflict of Interest:** The authors declared no competing interests.

**Ethical Clearance:** the ethical approval was obtained from the vice-chancellor of research and ethics committee of Urmia University of Medical Sciences with ethics number of

**Source of Funding:** Not

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