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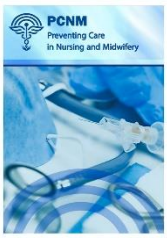

Original Article

Basic Life Support Training: Demonstration versus Structured Demonstration in Red Crescent Volunteers

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Abstract

Background: The Red Cross (Hilal-E-Ahmar) volunteers play a crucial role in responding to disasters, providing essential services, and supporting communities in need. One of the most important aspects of training for Red Cross volunteers is basic cardiopulmonary resuscitation (CPR), which aims to produce sufficient and lasting knowledge and skills.

Objectives: This study aimed to compare the effects of basic life support (BLS) training delivered through the demonstration method versus the structured demonstration method on the knowledge and skills of Red Crescent volunteers.

Methods: This randomized controlled trial involved 72 Red Crescent volunteers selected through convenience sampling. Participants were randomly assigned to two groups: one group received training in the demonstration method, while the other group was trained in the structured demonstration method. A knowledge questionnaire was completed before the training and again one month after the training. Skill assessment was conducted using a checklist one month post-training. The collected data were analyzed using SPSS version 22.

Results: In both groups, the mean knowledge scores showed a significant increase one month post-intervention for the structured demonstration method 10.74 (2.14) and for the demonstration method 8.92 (2.59), compared to pre-intervention scores of the structured demonstration method 13.83 (0.73) and the demonstration method 12.86 (1.64) ($p<0.001$). Although the mean knowledge scores one month after training were not statistically different between the two groups, the skill scores were significantly higher in the structured demonstration group 14.38 (1.39) compared to the demonstration group 11.25 (2.34) ($p<0.001$).

Conclusion: Both training methods effectively enhanced knowledge among participants; however, the structured demonstration training method resulted in higher skill scores compared to the demonstration method. Therefore, it is recommended that the structured demonstration training method be implemented for educating laypersons and rescue volunteers as first responders in cases of cardiopulmonary arrest.

Implications of this paper in nursing and midwifery preventive care

- Preventive care involves training community volunteers to deal with critical situations, such as cardiopulmonary arrest.
- The demonstration method and the structured demonstration method can effectively enhance volunteer preparedness to prevent the severe consequences of cardiopulmonary arrest and reduce mortality rates.

Introduction

Cardiac arrest is defined as the loss of cardiac function and systemic circulation [1]. One significant consequence of a heart attack is sudden cardiac arrest, which contributes to a substantial number of mortality cases [2]. Out-of-hospital cardiac arrest is a global public health issue [3]. Survival rates for out-of-hospital cardiac arrest are notably low, with only a few patients surviving [4,5]. Cardiopulmonary resuscitation (CPR) is a structured procedure performed on individuals experiencing cardiopulmonary arrest, aimed at maintaining circulation and respiration while providing adequate oxygen to vital organs to sustain life [6]. Initiating resuscitation efforts within four minutes of cardiac arrest can increase the likelihood of survival by two to four times [7]. Recent resuscitation guidelines have proposed strategies to improve the quality of CPR, such as adjusting the frequency and depth of chest compressions and ensuring complete release between compressions to improve the survival rate of victims [8]. Performing CPR before the arrival of emergency responders can prevent the transition of cardiac rhythms, such as ventricular fibrillation, to a systole, thereby preserving heart and brain function and enhancing survival chances [9]. Addressing this persistent issue requires adherence to established scientific principles and a high level of skill among responders [10]. Individuals who have received proper training in both basic and advanced life support (BLS) typically administer the most effective CPR [11]. Retaining knowledge and skills related to CPR is essential for an individual's ability to respond competently when required. Therefore, it is imperative to organize training programs in a manner that maximizes skill acquisition [12]. Unfortunately, numerous reports indicate that the quality of CPR is often compromised due to inadequacies in the execution of resuscitation techniques [8]. It is crucial to utilize diverse teaching methods to enhance skills such as CPR [13].

Effective training is essential for improving survival outcomes following cardiac arrest [14]. Although resuscitators are familiar with contemporary CPR techniques, the quality of skill execution is often inadequate, which negatively impacts patient survival rates [15]. Successful CPR outcomes in individuals depend on effective collaboration among community members, emergency medical services, and hospital personnel. Therefore, immediate and adequate CPR provided by bystanders is a crucial link in the survival chain [16]. The Red Cross continuously recruits individuals from various age groups and diverse educational, social, economic, and cultural backgrounds to provide training in basic cardiopulmonary resuscitation. Engaging and training volunteers can be beneficial not only in normal conditions but also during crises [17].

Various training methods are available for developing CPR knowledge and skills within this group, including lectures, videos, and demonstrations [18]. In our country, the Red Crescent Organization employs demonstration training on BLS manikins as the conventional method for teaching cardiopulmonary resuscitation. The demonstration method effectively imparts clinical skills. In this approach, a faculty clinician serves as an instructor, directly transferring knowledge and skills to learners through hands-on practice with mannequins [19]. However, this method has limitations. Hansen et al. (2020) showed that there was no statistically significant difference in the pass rate when comparing a demonstration with a lecture for introducing BLS/AED [20]. Additionally, Muhajir (2020) indicated that the demonstration method can be time-consuming and does not reduce the trainer's workload during clinical instruction [21].

One effective method in Structured Demonstration training involves a systematic approach that includes a brief overview, silent demonstration, demonstration with commentary, oral presentation, individual practice, and group practice. This structured approach is applied both theoretically and practically through various stages, culminating in group practice for learners. Such methods enhance skill retention and long-term recall [22,23]. The structured approach clearly delineates the instructor's role, providing explicit instructions at each stage to improve the learning process. It emphasizes a detailed educational framework in which the instructor facilitates learning [24]. Additionally, this training method prepares learners for teamwork in clinical settings [25]. A positive attitude toward education, characterized by careful planning and design that considers individuals' personal and social circumstances, along with the appropriate selection of educational methods and tools, can optimize the use of time and resources [26]. Given the importance of knowledge and performance in training community members and Red Crescent rescuers, further research is needed to evaluate the effectiveness and sustainability of the training provided.

Objectives

This study aims to compare the effects of CPR training using the Structured Demonstration method with those of a traditional demonstration method on the knowledge and skills of Red Crescent volunteers.

Methods

Study Design

In the present randomized controlled trial (IRCT20231129060221N1), conducted in 2023, the research population comprised 84 Red Crescent volunteers from Yazd Province, central Iran. Participants were selected through convenience sampling. Only volunteers with active membership in the Red Crescent Society and literacy were included in the study. Volunteers with prior experience in cardiopulmonary resuscitation (CPR) were excluded.

Participants

A sample size of 36 subjects per group was estimated based on the findings of Keegan et al. [27], considering a Type I error rate of 0.05, a test power of 90%, and an anticipated subject attrition rate of 10%. Ultimately, 72 individuals participated in the study (refer to the CONSORT Diagram). The researcher visited the study site with an introductory letter. A comprehensive list of all Red Crescent volunteers was compiled, and participants were provided with general information regarding the research objectives, methodology, and duration. They were assured that their information would remain anonymous and confidential, and that participation was voluntary, with the option to withdraw from the study at any time without consequence. Written informed consent was obtained from all candidates, who were informed about the possibility of being assigned to one of the intervention groups (Structured Demonstration Training Method or Demonstration Training Method). Participants completed a demographic characteristics questionnaire and a pre-test assessing their knowledge of CPR. Random assignment of research samples into two study groups was conducted using the RANDBETWEEN function in Excel.

The research setting was the Red Crescent Training Unit in Abarkooh County, Yazd Province, which is equipped with facilities for both theoretical training and clinical skills room. The basic life support skills were taught in a skills lab using mannequin-based simulations. Participants in each group were randomly divided into subgroups of 18. Training for each group was conducted separately in a one-day CPR workshop.

Interventions

The principles and theories of CPR were initially presented through lectures utilizing educational PowerPoint presentations for two hours, followed by practical training. Notably, the instructor was the principal investigator, a graduate of the Emergency Medical Service course and an instructor of the Cardiopulmonary Resuscitation course at the Red Crescent. The duration of training hours was consistent across both groups, three hours. However, the skills training component varied between the groups.

In the demonstration method, a pre-test was administered prior to the intervention. Subsequently, practical training was conducted using a mannequin. During this phase, key teaching points were emphasized, and upon completion, all participants practiced CPR on the mannequin. Participants were encouraged to ask questions, and the instructor addressed any uncertainties. The training session lasted 60 minutes, followed by an additional 60 minutes for individual practice in small groups, with 4 to 5 learners per group working with a mannequin.

In the Structured Demonstration method, a pre-test was conducted prior to the intervention. This training took place during a one-day workshop consisting of six stages. In the first stage (Brief Overview), the instructor motivated learners by outlining the concepts and objectives of the skills being taught. The second stage (Silent Demonstration) involved the instructor demonstrating the practical skills without any commentary. The third stage (Demonstration with Commentary) included interactive teaching, where the instructor provided

feedback as the skill was demonstrated. In the fourth stage (Oral Presentation), learners verbally articulated the skill, which enhanced their knowledge and understanding. The fifth stage (Practice) involved learners practicing the skill under the supervision of the instructor, with immediate corrections to prevent the reinforcement of incorrect techniques. Finally, in the sixth stage (Group Practice), participants were grouped into pairs of four to five members to perform collective exercises and collaboratively solve problems. The total duration of this training was approximately 60 minutes, allowing for opportunities for discussion and practice in small groups.

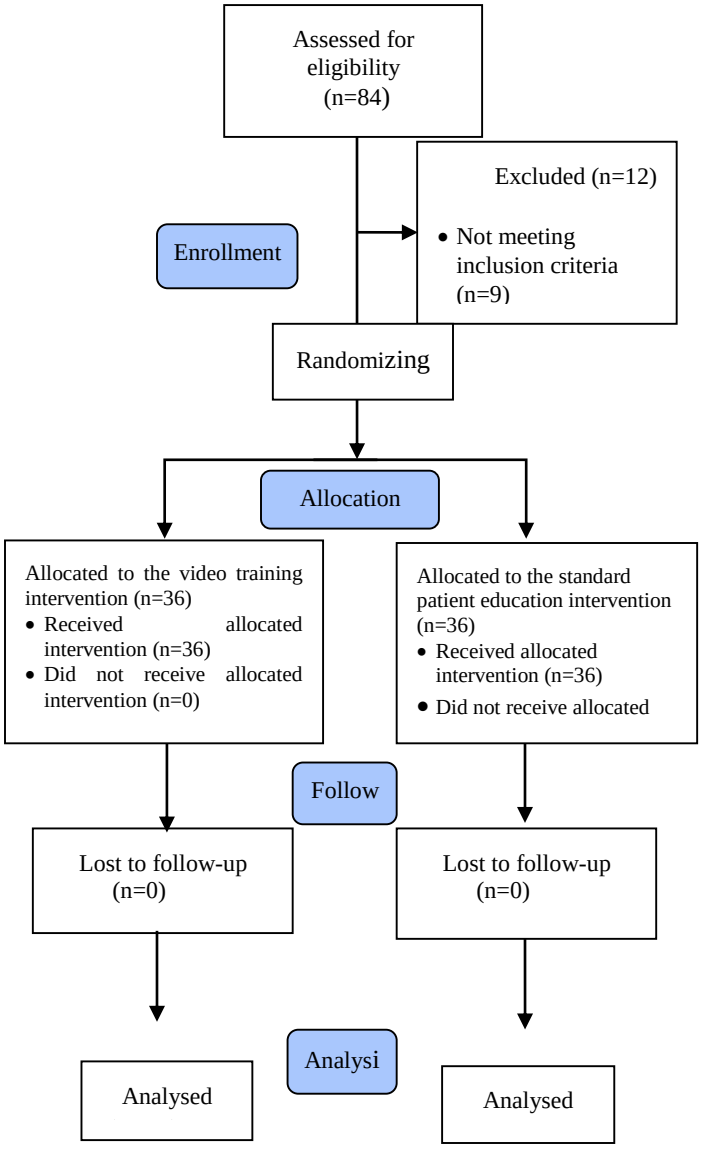

Figure 1: Consort Flowchart

Outcomes

The study utilized a Cardiopulmonary Resuscitation (CPR) Knowledge Questionnaire and a CPR Skill Assessment Checklist. The Basic Life Support Knowledge Assessment Questionnaire, developed by Shabannia et al. (2021), consisted of 15 items that covered essential CPR components, including timing, location, appropriate techniques, and maneuvers related to patient breathing and pulse. Each correct answer was awarded 1 point, while incorrect answers received 0 points. Scores ranged from 0 to 15, with higher scores indicating better CPR knowledge. The psychometric analysis revealed a reliability coefficient of 0.78, as determined by Cronbach's α method [28].

This study employed a researcher-developed checklist to evaluate basic life support skills, consisting of 16 items with binary response options. Each correct performance was assigned a score of 1, while incorrect performances received 0 points. Total scores ranged from 0 to 16, with higher scores indicating superior performance. The content and face validity of the checklist were established through feedback from 15 experts, including 10 emergency nurses and 5 emergency medicine specialists. The reliability of the checklist was confirmed using the intra-rater stability assessment method, with Cohen's kappa calculated at 0.86.

One month post-training, all participants were invited to complete the Cardiopulmonary Resuscitation Knowledge Questionnaire (post-test). Additionally, participants' CPR skills were assessed during a practical resuscitation test on a mannequin, utilizing the checklist. The examiner evaluated the skills of one participant at a time, remaining unaware of the training method each examinee had received.

Data were analyzed using SPSS version 22. Descriptive statistics, including the mean and standard deviation for quantitative variables, as well as frequency and percentages for qualitative variables, were calculated. The results of the Kolmogorov-Smirnov test indicated that the research variables demonstrated a normal distribution. In inferential statistics, independent t-test, paired t-test, Fisher's exact test, chi-square, and covariance were used. A significance level of 0.05 was considered.

Sample Size

A sample size of 36 subjects per group was estimated based on the findings of Keegan et al. [27], considering a Type I error rate of 0.05, a test power of 90%, and an anticipated subject attrition rate of 10%. Ultimately, 72 individuals participated in the study (refer to the CONSORT Diagram).

Results

A total of 72 qualified volunteers participated in the study, of which 33 males (46%) and 39 females (54%). The results of the chi-square test indicated no significant differences between the groups concerning gender, occupation, marital status, age, and education. Furthermore, there was no significant difference in the mean age between the two groups. Additional qualitative characteristics of the study participants are presented in Table 1.

Table 1. Comparison of Qualitative Demographic Variables of Red Crescent volunteers in Two Study Groups

Variables		Structured Demonstration		Demonstration		*p**
		Number	Percent	Number	Percent	
sex	female	16	44.00	17	47.00	0.81*
	male	20	56.00	19	53.00	
Marital status	married	16	44.00	13	36.00	0.40*
	single	20	56.00	23	64.00	
Job	housewife	19	55.00	20	55.00	1**
	Employee	5	14.00	4	11.00	
	the student	5	14.00	6	17.00	
	freelance job	7	17.00	6	17.00	
age	20-30	18	51.00	26	76.00	0.13*
	31-40	12	32.00	6	17.00	
	More than 41	6	17.00	4	7.00	
education	Less than a diploma	16	42.42	8	22.00	0.13*
	diploma	10	27.27	16	44.00	
	Higher education	10	30.30	12	34.00	

***Chi-Square Tests; **Fisher Exact Test; N=36 in each group**

In the Structured Demonstration training method, the mean score of cardiopulmonary resuscitation (CPR) knowledge significantly increased one month after the intervention (p<0.001). Similarly, the demonstration training method also showed a statistically significant positive effect on training outcomes one month post-intervention (p<0.001) (Table 2).

Table 2. Comparison of the Average Score of Basic Life Support Knowledge in the Two Study Groups before and One Month after the Intervention

Group	Before intervention Mean (SD)	One month after the intervention Mean (SD)	t	*p***
Structured Demonstration	10.74(2.14)	13.83(0.73)	-9.70	<0.001
Demonstration	8.92(2.59)	12.86(1.64)	-15.28	<0.001
t	3.22	3.24		
p*	0.002	0.002		

***Independent t test; ** paired t test**

The results of the independent t-test indicated a statistically significant difference between the two study groups before the intervention (p = 0.002). To control for baseline differences, a covariance

analysis was conducted on the post-test knowledge results. The findings of this covariance analysis are presented in Table 3

Table 3. Covariance Results for Knowledge Score in Participants

Variable	Source	ss	df	ms	f	*p*	Etta
Knowledge score	intercept	363.97	1	363.97	432.62	<0.001	0.86
	Pre-test variable	55.25	1	55.25	65.67	<0.001	0.48
	Group membership	1.39	1	1.39	1.65	0.20	0.02
	error	58.05	69	0.84			

ms: Mean Squares; ss: Sum of Squares.

The covariance results indicated no significant difference in the post-test knowledge scores between the groups (F=1.65, $p>0.05$). Furthermore, the effect size (η, Eta) indicated that both the Structured Demonstration training method and the demonstration training method explained only 2% of the variance in CPR knowledge among the participants, which is statistically insignificant.
One month after the intervention, the mean score for CPR skills using the Structured Demonstration training method was significantly higher than that of the Demonstration training method (p = 0.001) (Table 4).

Table 4: Comparison of the Mean Score of Basic Life Support Skills in the Two Study Groups One Month after the Intervention

Group	Mean (SD)
Structured Demonstration	14.38 (1.39)
Demonstration	11.25 (2.34)
t	6.89
***p* ***	</001

*Independent t test

Discussion

The present study compared the effects of CPR training utilizing structured demonstration methods versus demonstration training methods on the knowledge and skills of basic life support among Red Crescent volunteers. The results indicated that both educational methods were effective in enhancing CPR knowledge. Therefore, based on the findings, teaching the theoretical issue of basic life support in both groups through lectures and slide presentations was accompanied by the acquisition of sufficient knowledge. This result is consistent with the findings of other studies. Salehpoor-Emran et al. (2015) demonstrated that online basic CPR training, which included content explanations and slide presentations, improved the knowledge and practice of the Red Crescent Student Association volunteers [29]. Khademian et al. (2020) reported that basic CPR instruction, which included two hours of oral teaching through lectures, significantly enhanced the villagers' knowledge of basic CPR [30]. Gurung et al. concluded that a structured teaching program significantly increased CPR knowledge among B.Sc. Nursing students at Dayananada Sagar [31]. Shabannia et al. (2021) found that both mannequin training and video training could enhance staff awareness of CPR [28]. This finding aligns with the study by Meenakshisundaram et al. (2023), which observed an improvement in CPR knowledge post-training through lecture-based teaching among school-going adolescents [18]. Neelima et al. (2016) demonstrated that a demonstration on basic life support (BLS) was effective in improving the knowledge of family members of adult patients at high risk of cardiopulmonary arrest [32]. Therefore, based on the findings of the present study and previous research, CPR training in various ways, which is basically accompanied by explanation and

demonstration of content, is associated with increasing knowledge in the area of basic cardiopulmonary resuscitation (CPR). The literature review indicates that most studies have focused on students or healthcare professionals. In contrast, the current study examined Red Crescent volunteers, who lack specialized education in healthcare. Enhancing their knowledge and skills demonstrates the effectiveness of CPR training within this group. Furthermore, this training increases community preparedness for emergency situations, including natural and man-made disasters. Additionally, these volunteers can disseminate basic life support knowledge within their families and communities, ultimately improving survival rates in cardiac arrest situations.

Another noteworthy finding from our study was that, one month after the intervention, the mean skill score in the Structured Demonstration training was higher than that in the demonstration-training group. Khademian et al (2020) stated that basic teaching of CPR, which included demonstration, practice on a manikin, provision of feedback, and correction of errors, revealed that these methods could enhance the villagers' performance of basic CPR techniques [30]. This intervention corresponds with the outcomes reported by Kim and Ahn (2019), who declared that the 5-step method of infant CPR training for nursing students was effective in improving performance abilities in a sustained manner and promoting a positive attitude among the groups both one week and six months after training [33]. Neelima et al. (2016) demonstrated that mannequin demonstrations of Basic Life Support (BLS) were effective in improving the skills of family members of adult patients at high risk of cardiopulmonary arrest [32]. In explaining the findings, it can be concluded that the significant skill improvement observed in the structured training group may be attributed to its comprehensive design, which includes several stages: a brief overview, silent demonstration, demonstration with commentary, oral presentation, individual practice, and group practice. This structured approach effectively integrates theoretical and practical content at various stages, culminating in group practice and feedback, which enhances retention in the learners' minds.

One of the strengths of this study is that it represents the first interventional effort to compare the effects of basic life support training using structured demonstration and demonstration methods on the knowledge and skills of Red Crescent volunteers in Iran marking an innovative contribution to the field. However, one limitation of the present study is that knowledge was assessed one month post-intervention. To investigate the long-term retention of the material, future studies should employ a broader time frame for evaluation.

Conclusion

Based on the findings, both group demonstration and structured demonstration training methods were effective in increasing knowledge of performing cardiopulmonary resuscitation. The skill scores of participants in the structured group training method were higher than those in the group demonstration method, resulting in improved cardiopulmonary support skills among Red Crescent volunteers. Therefore, it is recommended to utilize both methods, particularly the structured demonstration method, in training the public and Red Crescent volunteers as first-line responders in the treatment of cardiac arrest.

Ethical Considerations

In adherence to ethical guidelines as per the Declaration of Helsinki, all ethical provisions were observed throughout the study. Participants provided informed consent to partake, ensuring confidentiality and anonymity of personal information. They were also informed of their right to withdraw at any point during the study. The study protocol received approval from the Committee of Ethics in Human Research at Shahid Sadoughi University of Medical Sciences,

Yazd, Iran (Code: IR.SSU.REC.1402.024). The study has been registered with the Iranian Registry of Clinical Trials under the code: IRCT20231129060221N1.

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Conflict of Interest

The authors declare that they have no competing interests

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Medical Sciences, Yazd, Iran (code 15669). The funders played no role in the study's design, data collection, analysis, or interpretation. The authors will provide the final report of the study's findings to the funders upon completion.

Authors' Contributions

Abbaszadeh Mehrabadi E., Javadi M., Heydari S., and Nasiriani K. conceptualized and designed the study. Abbaszadeh Mehrabadi E. collected the data, while Javadi M. and Abbaszadeh Mehrabadi E. conducted the data analysis. All authors contributed to manuscript preparation and approved the final version.

Artificial Intelligence Utilization

The authors declare that no generative AI technologies were used in the creation of this manuscript.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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