

Investigating the Effects of a Training Package on the Knowledge and Performance of Nurses Working in the Intensive Care Unit about Cardiopulmonary

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ABSTRACT

Background: Many patients with serious heart conditions or other problems such as heart attack refer to the emergency department every day hoping to escape from the deadly event.

Aim: To investigate the effects of using a training package on the knowledge and performance of nurses working in the intensive care units of educational hospitals of Ilam about cardiopulmonary resuscitation (CPR) in 2019.

Methods: This semi-experimental study with a pretest-posttest design was performed on 40 nurses. A validated questionnaire including 20 questions was used for data collection, and data analysis was conducted in SPSS V.19 using descriptive (frequency, mean, standard deviation) and inferential (correlation, linear regression, and t-test) statistics. The significance level was considered at $P < 0.05$.

Results: In the present study, 31(77.5%) of the nurses were women, and 9(22.5%) were men. Regarding employment status, 27(67.5%) were contractually, and 13(32.5%) were formally employed. Also, 39 (97.5%) had bachelor's, and one (2.5%) had master's degree. The results of the study showed that the levels of knowledge and performance of the participants about CPR significantly increased after training ($P < 0.0001$).

Conclusion: The results of the study showed that most nurses performed CPR based on old protocols. It is necessary to educate updated protocols during retraining courses. In addition, as the levels of knowledge and skill reduce over time, it is necessary to continuously repeat these courses.

Keywords: Cardiopulmonary Resuscitation CPR Training, Heart pain

INTRODUCTION

Cardiopulmonary resuscitation (CPR) involves measures to recover the vital functions of the two major organs; the heart and brain, in an unconscious person, and to artificially restore the blood circulation and respiration until the natural blood flow returns to normal. Many patients suffering from serious heart conditions or similar problems leading to heart attacks seek emergency services every day hoping to recover from the deadly conditions. The history of CPR backs to 1960 when Hoven for the first time performed CPR along with cardiac massage. So far, there have been a lot of progresses in the protocols, the drugs used, and the skill of medical staff in performing CPR; however, the mortality rate of cardiac arrest is still high. From most important factors affecting the outcome of CPR include unskilled staff, and delayed deliverance of the massage therapy⁽²⁻³⁾. Nurses are among the first individuals who are present at the patient's bed at the time of cardiac and pulmonary arrest. Therefore, they need to be adequately skilled to perform the protocol. Since the late 1980s, several studies have been conducted on the skill levels of medical staff in performing CPR². Some of these studies have shown the positive effects of the presence of trained people on the outcome of resuscitation process. The results of one of these studies showed that even the presence of even one skilled person could have a tremendous effect on the outcome of resuscitation process³.

Advanced cardiovascular care guidelines were published in 1970 by the American Heart Association, and

since then they have been used to teach resuscitation skills around the world². Studies on cardiac arrests in hospitalized patients at the University of Chicago have shown that the quality of resuscitation process varies even when it is performed by trained personnel, and that the followed protocol is often not based on published guidelines. Also, most internal ward residents have had very little experience during the first year of residency and have sometimes been inexperienced⁽³⁾. The results of several studies have shown that hospitals that have trained and experienced teams deliver higher success rates of resuscitation and hospital discharge. In a study conducted at Imam Khomeini Hospital of Tehran, the success rate of resuscitation increased from 18.4% to 30% when the process was performed by a trained team. The results of this study showed that the use of trained teams can significantly improve the outcome of resuscitation process⁽⁴⁾. Other studies have shown that training on CPR affects physicians' and nurses' performance and increases patients' survival rates⁵⁻⁸. Numerous studies have indicated that the level of knowledge of doctors, nurses, and other health workers about the resuscitation process is very low, and that there is no accurate information about this in Iran⁽⁹⁻¹¹⁾. According to the above explanations, the present study aims to investigate the effects of an educational package on the knowledge of nurses working in the intensive care units of educational hospitals of Ilam about CPR in 2019.

MATERIALS AND METHODS

The study population included the nurses working in the intensive care units of Ilam educational hospitals. The

inclusion criteria were giving informed consent, having at least one year of working experience in the intensive care unit, and having at least a bachelor's degree in nursing. The only exclusion criterion was the participant's withdrawal from the study.

Sample size calculation: The sample size according to the below formula was calculated as at least 40.

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (s_1^2 + s_2^2)}{(\mu_1 - \mu_2)^2}$$

Data collection: To collect the data, a questionnaire including 20 standard questions was used. The validity and reliability of the questionnaire have already been confirmed¹².

Study design: This research was an intervention study. The research environment was the intensive care units of the Shahid Mostafa Khomeini and Imam Khomeini educational hospitals of Ilam. The research community included nurses working in intensive care units.

After obtaining an approval from the Ethics Committee of Ilam University of Medical Sciences (IR.MEDILAM.REC.1398.120), and permission from the hospitals' officials, the researcher referred to the care units. The participants were selected by available sampling method. In this study, 40 nurses were selected from the CCU and ICU departments. The researcher went to these units for multiple times, and after introducing himself and selecting eligible people, he gave them the questionnaire. After that, the scores were calculated (pre-training).

Intervention: The same nurses participated in a training class about the fundamentals and updated protocol of CPR. After one week of the training class, the same questions were again asked from them.

Statistical analysis: In order to analyze the data, the normality was initially checked in the two groups using the Kolmogorov-Smirnov test. Also. The variance equality was assessed by the Leven test. After confirming the normality of the data, t-paired test was used to compare before and

after knowledge scores (within groups) in the both groups. The data was analyzed using SPSS version 19. An error rate of < 5% was used to interpret the results.

RESULTS

Most of the participants were women 31(77.5%). Regarding employment status, 27(67.5%) were contractually, and 13(32.5%) were officially employed. Moreover, 39(97.5%) were B.Sc (bachelor's degree), and one (2.5%) was senior (masters' degree).

Based on the results of the normality test, the P values for the four set of data (the nurses' performance scores before and after the training, and their knowledge scores before and after the training) were > 0.05 indicating the normality of the data. So, the pairwise parametric t-test was used for data analysis (Table 1). The results showed that the level of knowledge about CPR significantly increased after the training intervention (P <0.001, Table 2). Our results also showed that the participants' CPR performance score significantly increased after the intervention (P <0.001, Table 3).

According to Table 4, mean knowledge scores in men were 9.56 and 16.33 before and after the training, respectively. Furthermore, the mean performance score in men significantly increased from 13.22 (pre-training) to 15.33 (after-training) (P<0.001). The mean knowledge scores in women were 11.16 (before-training) and 15.9 (after-training), and the mean performance scores were 13.23 (before-training) and 14.61 (after-training). According to this, the performance of female nurses in CPR significantly improved after the training intervention (P <0.01).

Table 5 shows the correlations between demographic variables and CPR knowledge and performance scores. The correlation between age and working experience was significant and positive (r=0.953). A correlation coefficient closer to one indicates a stronger relationship.

Table 1. Normality analysis of knowledge and performance scores before and after training

Dimensions	Performance (after)	Knowledge (after)	Performance (before)	Knowledge (before)
N	40	40	40	40
Mean	14.78	16	31.23	10.8
SD	1.5	2.77	1.9	2.68
Absorption	0.158	0.141	0.128	0.102
Positive	0.142	0.090	0.0125	0.102
Negative	-0.158	-0.141	-0.128	-0.091
Statistical test	0.158	0.141	0.128	0.102
Significance level	0.113	0.054	0.098	0.200

Table 2: Mean±SD knowledge scores before and after cardiopulmonary resuscitation training

Phase	N	Minimum	Maximum	Mean	SD	P value
Before training	40	5	16	10.8	2.68	<0.001*
After training	40	9	20	16	2.77	

* paired student t-test

Table 3: Mean performance scores before and after cardiopulmonary resuscitation training

Phase	N	Minimum	Maximum	Mean	SD	P value
Before training	40	9	19	13.23	1.9	<0.001*
After training	40	11	19	14.78	1.54	

* paired student t-test

Table 4: The comparisons of knowledge and performance scores between males and females before and after cardiopulmonary resuscitation training

Dimension		N	Minimum	Maximum	Mean	SD	P value
Male (knowledge)	Pre-	9	5	13	9.56	2.74	<0.001
	Post-	9	11	20	16.33	2.91	
Male (performance)	Pre-	9	11	15	13.22	1.09	
	Post-	9	13	19	15.33	1.73	
Female (knowledge)	Pre-	31	7	16	11.16	2.59	
	Post-	31	9	20	15.9	2.77	
Female (performance)	Pre-	31	9	19	13.23	2.09	
	Post-	31	11	17	14.61	1.47	

Table 5. Correlations between demographic variables and the scores of knowledge and performance

Variables	Test	Work experience	Age	Knowledge (before)	Performance (before)	Knowledge (after)	Performance (after)
Work experience	P.c.	1	0.953	0.207	0.164	0.159	0.145
	P		<0.001	0.199	0.312	0.326	0.373
	N	40	40	40	40	40	40
Age	P.c.	0.953	1	0.181	0.168	0.122	0.108
	P	<0.001		0.263	0.299	0.452	0.505
	N	40	40	40	40	40	40
Knowledge (before)	P.c.	0.207	0.181	1	0.237	0.114	0.076
	P	0.199	0.263		0.140	0.485	0.643
	N	40	40	40	40	40	40
Performance (before)	P.c.	0.164	0.168	0.237	1	0.073	0.323
	P	0.312	0.299	0.140		0.655	0.042
	N	40	40	40	40	40	40
Knowledge (after)	P.c.	0.159	0.122	0.114	0.073	1	0.204
	P	0.326	0.452	0.485	0.655		0.208
	N	40	40	40	40	40	40
Performance (after)	P.c.	0.145	0.108	0.076	0.323	0.204	1
	P	0.373	0.505	0.643	0.042	0.208	
	N	40	40	40	40	40	40

P.c.: Pearson correlation

DISCUSSION

The aim of this study was to determine the effects of a training package on the knowledge and performance of nurses working in the intensive care units of educational hospitals in Ilam about CPR in 2019. The findings of the present study showed a normal distribution in the data of both knowledge and performance scores at pre- and post-training. So, parametric paired t-test was used to analyze the data. Our study revealed significant improvements in the nurses' both knowledge and performance scores after the training.

The results obtained in this study were consistent with those of Tyfenji et al. (2011)¹⁸. In the recent study, students received either simulation-based (intervention) or lecture-based (control) trainings about the heart and lung physiology and function. The results indicated no significant difference in the students' confidence to evaluate heart and lung between the simulation and lecture groups¹⁸.

Other studies have reported different results. In a study in 2015, Applegate et al¹⁹ performed trainings on CPR using an external automatic defibrillator using mobile phone, game, and mannequin in 203 participants whose attitudes were assessed before and after the training sessions. The findings showed that the students' attitudes significantly improved toward using CPR and external automatic defibrillators after the training sessions¹⁹.

Our results showed that the participants' levels of knowledge and performance about CPR were significantly higher after the training intervention in comparison with pre-training levels (P<0.001). Habibi and Mehri (2014) reported

in their study that training on cardiopulmonary-cerebral resuscitation significantly improved the awareness of Red Crescent rescuers who had very limited information on this issue⁽²⁰⁾. Also, Cheraghiet al. (2010) in their study concluded that fundamental trainings can increase nurses' awareness about the basics and advanced aspects of CPR and regular, so they recommended holding continuous theoretical and practical workshops and training courses on cardiopulmonary cerebral resuscitation²¹. Also, in another study conducted by Salari et al (2010) on the effects of cardiopulmonary cerebral resuscitation management on the outcomes of the process, it was found that the implementation of the resuscitation management process can be used as a model by hospital managers to increase patients' survival rates after resuscitation²². In the study of Abdollahi et al. (2010), CPR station training improved the performance of nursing and midwifery students in basic and advanced resuscitation. Based on this, it was recommended to conduct basic and advanced training courses on cardiopulmonary cerebral resuscitation for nurses at regular intervals to meet their educational needs. Comparing the mean scores before and after cardiopulmonary cerebral resuscitation management training showed that nurses' awareness significantly increased after the educational workshop²³. In their study, Monjamed et al. (2006) concluded that a coherent cardiopulmonary cerebral resuscitation training program positively affected nurses' awareness and improved their performance and speed during facing critically ill patients

with cardiac arrest, which can be life-saving in these critical moments^{24,25}.

Marilyn et al (2010) in a research on 37 nursing and midwifery students studying in their last semester showed that practical training on cardiopulmonary cerebral resuscitation was an effective method to boost the students' performance²⁶. Robert et al. (2009) in a similar study on 89 nurses showed that training cardiopulmonary cerebral resuscitation increased nurses' awareness and improved their motor skills. Based on this, they recommended educating nurses about adult and neonatal cardiopulmonary cerebral resuscitation based on the latest therapeutic protocols²⁷.

CONCLUSION

Our results showed that most nurses performed CPR based on old protocols. So, it is necessary to educate nurses the latest updates on this issue during retraining courses. In addition, as the levels of knowledge and skill reduce over time, it is necessary to continuously repeat these courses.

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