The effect of CPR educational package on knowledge and performance of nurses working in intensive care units: A review study

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ABSTRACT

Because nurses are present at the bedside of patients with cardiopulmonary arrest at the earliest opportunity, they should be sufficiently skilled in performing cardiopulmonary resuscitation (CPR). Since 1980s, several studies have been performed on the skill of CPR. These studies showed the effect of the presence of trained people on the outcome of resuscitation, so the results of one of these studies indicated that the presence of a more skilled person can have a dramatic effect on the outcome of resuscitation. Researchers believe that each training leads to learning, but the depth and stability of learning are different in various teaching methods. Recent Studies have examined the effectiveness of various educational programs in creating sustainable learning. One of the most common methods for teaching CPR is the workshop method, which has been used in nursing since 1941. Considering the importance of the subject and the need to study the effect of training courses on the level of knowledge and CPR performance of health care professionals, especially nurses, the present study aimed to review the effect of training package on knowledge and CPR performance of nurses working in intensive care units (ICU). A review of the literature showed that the level of knowledge and performance of nurses about CPR increased significantly after training compared to before training. However, most nurses perform CPR based on old protocols, it is necessary to express these changes during retraining courses. In addition, due to the decrease in the level of knowledge and skills, it is necessary to repeat these courses overtime.

Keywords: CPR educational package, intensive care units, resuscitation

Introduction

Many patients with severe heart pain or similar cases leading to heart attacks seek emergency services every day hoping to recover from the deadly conditions.¹ Cardiopulmonary resuscitation (CPR) involves measures taken to restore the vital functions of the two important organs; the heart and brain, in a person who has lost consciousness, and to artificially restore the blood circulation and respiration until the natural blood flow returns to normal.² Nurses are present at the bedside of patients with cardiopulmonary arrest at the earliest; therefore they should be sufficiently skilled in performing CPR. Earlier studies showed the effect of the presence of trained people on the outcome of resuscitation, so that the results of one of these studies indicated that even the presence of a more skilled person can have a dramatic effect on the outcome of resuscitation.³ Most important factors affecting the outcome of CPR include unskilled staff, and delayed delivery of the massage therapy.³⁴

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Results of several studies have shown that the use of a trained dedicated team for resuscitation operations significantly improves the resuscitation process (increasing the number of successful resuscitation cases from 0.4% to 30%). Some studies have shown that CPR training has an effect on the efficiency of physicians and nurses as well as increasing survival.

However, unfortunately, the theoretical and practical training on CPR operations are not well defined in the curriculum of medical sciences departments and university graduates, depending on their interest, have different levels of knowledge and skills in this field. Adequate skills and knowledge in CPR is a requirement of medical teams. Of course, it should be noted that increasing learning does not necessarily lead to performance improvement, and studies often point to the effect of workshop training on nurse’s learning. Considering the importance of the subject and the need to study the effect of training courses on the level of knowledge and CPR performance of health care professionals, especially nurses, the present study aimed to review the effect of training package on knowledge and CPR performance of nurses working in intensive care units (ICU).

Literature search
We conducted a comprehensive review of the English or Persian literature involved in the effect of CPR training on knowledge and performance of nurses working in the ICU wards. The electronic databases MEDLINE, PubMed, Scopus, Science direct, and EMBASE were searched on August 2021 for reporting the outcomes of the effect of CPR training on knowledge and performance of nurses. Reference lists of published papers were also hand-searched in an attempt to identify further reports. The following key words were used: CPR; knowledge and performance of nurses; CPR training; ICU; and critical care unit (CCU). The search terms were then entered onto Google Scholar, to ensure that articles were not missed. Papers were excluded if they were case reports or had a patient cohort, not written in English or Persian, lacked documentation, nonhuman studies, narrative reviews, studies without clinical outcomes data, systematic reviews that did not pool data or perform a meta-analysis, and technique articles without outcomes. We then obtained full manuscripts for those studies that met the inclusion criteria. Search algorithm of articles included in the literature review is presented in [Figure 1].

History of cardiopulmonary resuscitation
The ICU is one of the specialized departments in hospitals that provide special care and treatment services. Different parts of this section include ICU, CCU, intensive treatment unit (ITU), cardiopulmonary unit, and chest pain unit. CPR is an activity performed for basic life support, including aids for airway management, patient monitoring, rapid defibrillation, venipuncture, and medication administration. The history of CPR dates back to 1960, when Barkon Hoven for the first time performed CPR with cardiac massage. So far, there have been many advances in the methods, the drugs used, and the skills of the treatment staff in performing CPR; however, the mortality rate after cardiac arrest is still higher than other cases. Before the 1950s, little was known about CPR techniques. Modern CPR began in the 1960s, and research about cerebral resuscitation after cardiac arrest began in the 1970s. These advances have led to the conversion of CPR to cardio pulmonary cerebral resuscitation (CPCR), an important goal of which is to restore heart and lung function and maintain brain function.

The most important factors affecting the outcome of CPR include unskilled staff, and delayed delivery of the massage therapy. Since the late 1980s, several studies have been conducted on skills in CPR operations. The Advanced Cardiovascular Care Guideline was published by the American Heart Association in 1970 and has been used to teach resuscitation skills around the world ever since. Data from the studies of nosocomial cardiac arrest at the University of Chicago have shown that the quality of resuscitation varies and, even when performed by trained personnel, was often not based on published guidelines. In 1996, Inwood investigated the effect of a workshop approach on nurse’s sustainable learning about CPR. The results showed that the knowledge of nurses was initially poor but showed a significant increase after the workshop that remained stable for up to 6 months.

The role of nurses in performing CPR
Several studies have shown that the level of knowledge of the physicians, nurses and other health staffs in the field of resuscitation was very low and there was no accurate information about this in some countries. Nursing knowledge has a very important role in observing the standards, protocols, and order of CPR steps (including massage, medication, and endotracheal intubation), which have a significant impact on the speed of operation and how to perform the CPR process, and ultimately the performance of medical staff. Nurses are present at the bedside of patients with cardiopulmonary arrest at the earliest opportunity; therefore they should be sufficiently skilled in performing CPR. However, studies on medical staff in hospitals show a low level of knowledge and skills of these staff, as Saghizadeh et al. reported that <10% of nurses in CCU wards have sufficient skills in performing CPR.

The subject of CPR is one of the most important topics in nursing courses that has been addressed in academic textbooks. Although resuscitation of patients is performed by different members of the resuscitation team with different specializations; the important role and position of nurses in the resuscitation team, and identification of patients with critical conditions, and prevention of cardiac arrest, and timely and principled resuscitation as well as follow-up care are undeniable for promoting the consequences of resuscitation in hospitalized patients. Because nurses are among the first members of the resuscitation team who encounter patients in need of CPR in the early stages and have a very sensitive role in the life of the patient. Nurses must also have sufficient knowledge, skills, and confidence in CPR. The presence of trained nurses is very effective in the outcome of resuscitation and the presence
of a person with more skills and high self-efficacy can have a tremendous impact on the outcome of resuscitation.

**Results of studies related to the level of skill in resuscitation operations**

Although resuscitation skills are essential for members of the health team, some studies have reported that most physicians and medical staff do not have the required knowledge and skills in this field. The results of a study in Iran reported that 82% of the medical staffs in Kashan hospitals had poor knowledge and 71% had poor skills of resuscitation. Another study examining the knowledge and skills of medical interns in Mazandaran University of Medical Sciences (Mazandaran, Iran) in the field of resuscitation reported that out of 80 interns, none had complete skills in resuscitation and the knowledge was poor in half of them. Another study examining the knowledge of the medical staffs of ten hospitals about the conditions and methods of CPR, showed that these people did not have the appropriate knowledge. Furthermore, another study examining the knowledge of 69 medical interns showed that interns answered an average of 47% of the test questions correctly. By studying the basic and advanced CPR skills of nursing students at two universities in Sweden and Finland, Marja et al. reported that students at both universities did not have the necessary skills. The results of another study showed that most nursing students did not know the appropriate number of cardiac massages and one third of them did not answer the questions about the correct ratio between artificial respiration and the number of cardiac massages. In addition, only 26% of the students participated in the actual resuscitation operation. They reported that although half of the students rated their resuscitation skills well; but only 21% and 33% of them did cardiac massage and artificial respiration correctly.

**The effect of training on knowledge and CPR performance**

The training packages contain valuable and concise points about the subject in several forms: booklets, pamphlets, videos, and photos. These packages, which include a conference, a booklet, questions, and a CPR training video, are provided to nurses. Researchers believe that each training leads to learning, but the degree and stability of learning is different between various teaching methods. A large part of the studies of recent years have examined the effectiveness of various educational programs in the field of creating sustainable learning. One of the common methods for teaching CPR operations is the workshop method that has been used in nursing since 1941. In an extensive literature review, the use of computer programs, voice mannequins, and computer simulations were introduced as the best methods for increasing nurses’ knowledge and skills. Therefore, it can be said that the success and coherence of CPR operations will be achieved if the necessary measures are taken, quickly, completely, and consecutively. If resuscitation is done quickly, in 50% of cases, it will save human lives. But
The success of resuscitation requires the skill and performance of resuscitators, and the salvation of individual in the critical moments of the struggle with life and death, depends only on the level of knowledge, awareness, and mastery of those present at his/her bedside. In these moments, the existence of efficient and knowledgeable personnel is one of the inalienable rights of the patient.

The results of a study on the knowledge and performance of nurses working in CCU wards about CPR showed that 9.7% of nurses were very skilled in performing CPR. However, in above study, intubation training method was used during CPR. According to the 2015 CPR Guideline, chest massage is the first step in initiating CPR, and intubation is not necessary due to new strategies, including respiratory reserve masks, and CPR can even be continued without intubation. In another study nurses’ performance was evaluated and compared aimed at investigating the effect of CPR training and holding training workshops on the performance of nursing staff. The results of the mentioned study showed that the performance of the research units was 81.8% ± 11.6% and 81.53% ± 11.4% in assessing the level of consciousness and in contact with the rehabilitation team, respectively, which was increased to 100% after practical training. In cases such as using oxygen mask, it increased from 42.9% ± 7.8% to 56.25% ± 8.3%. Regarding all questions in all medical centers, there was a statistically significant difference between the scores obtained before and after training. In general, the researchers concluded that the educational intervention improved the level of knowledge and skills of nurses in the field of CPR. The results of another study aimed at assessing the knowledge of medical assistants with CPR showed that the mean scores before and after the intervention were 10.24 ± 3.4 and 13.35 ± 2.9%, respectively. The difference was statistically significant and education caused a 30% improvement in the knowledge of individuals. This study showed that the level of knowledge and awareness of residents about CPR is not acceptable and it is necessary to hold appropriate training courses to improve knowledge and skills at appropriate intervals.

The results of the study by Munezero et al with the aim of identifying the thoughts and experiences of nursing students from the CPR video self-assessment performed on the mannequin, showed that reobservation of their practical work by the students makes them better aware of their weaknesses and eliminate them. Mannequin training reduces stress and ultimately creates better adaptation to the existing conditions. The results of Sutton et al in 2016 showed that the average score of CPR performance increased from 16.14 before training to 24.5 after training through educational videos, in which this difference was statistically significant. In that study, it was stated that the use of educational videos increases awareness far more than face-to-face training, and one of the reasons for this is watching the film several times and at different hours. Recently, a study was conducted in Iran on 40 nurses in 2019 to investigate the effect of using the training package on the knowledge and performance of CPR of nurses working in the ICU of Ilam teaching hospitals. The results of this study showed that the mean scores of knowledge before training were 10.8 ± 2.68 which changed to 16 ± 2.77 for after training. The mean performance score before and after training were 13.23 ± 2.1 and 14.78 ± 2.2, respectively. The results of the study showed that the level of knowledge and performance of participants about CPR training increased significantly after the intervention compared to before the intervention. Other studies also showed that nurses’ CPR knowledge was low before the educational intervention. A summary of recent studies on the effect of using CPR training packages on nurses’ knowledge and performance is presented in [Table 1].

### Conclusion

Due to the importance of appropriate knowledge and skills of the health team in the field of CPR, most studies in this field have

| First author (Ref.) | Title | Main point | Year of publication |
|---------------------|-------|------------|---------------------|
| Bac[9]              | A Study on Factors for Improving CPR Based on Health Care Professionals … | It can be helpful to develop and apply a phased, customized education program using training simulators as well as personalizing them to increase the personnel's confidence in CPR performance | 2021 |
| Taghinejad[3]       | Investigating the Effects of a Training Package on the Knowledge and Performance of Nurses … | Most nurses performed CPR based on old protocols. It is necessary to educate updated protocols during retraining courses | 2020 |
| Tavan[9]            | Comparison of Efficacy in Improving CPR Performance Between Video Training and the Standard Method | Raising awareness about CPR performance among nurses and doctors with the aid of videos can augment the performance score | 2018 |
| Sutton[10]          | Physiologic Monitoring of CPR Quality During Adult Cardiac Arrest … | The use of educational videos increases awareness far more than face-to-face training | 2016 |
| Ahmed[28]           | Effect of an Educational Program on Nurses’ Knowledge … | The presence of a significant lack in the knowledge of nurses about pediatric CPR before application educational program | 2016 |
| Applegate[31]       | The Implementation of CPR Training Using Mobile Uploads, Gamification … | CPR training using direct feedback manikins can have a significant positive effect on students’ attitudes towards performing CPR | 2015 |
focused on examining the knowledge and skills of nurses and medical interns. However, limited studies have been performed on nurses’ knowledge and performance using the educational package. The results of earlier studies showed that most of the nurses perform CPR based on old protocols, therefore it is necessary to update them on updated protocols during the retraining courses. However, officials should plan to improve the knowledge and the strength points of their staff. In addition, due to the decrease in the level of knowledge and skills, it is necessary to repeat these courses overtime. Due to the shortage of studies on the knowledge and skills of nurses in the CPR position, studies are necessary on nurses’ skills and its change overtime, as well as the effect of using the training package on the knowledge and CPR performance of nurses working in ICU at different situations.

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Conflicts of interest
There are no conflicts of interest.

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