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Barriers to the success of cardiopulmonary resuscitation from the perspective of Iranian nurses: A qualitative content analysis

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ABSTRACT

Background: The survival rate following Cardiopulmonary Resuscitation (CPR) has been reported to be 7–26.7%. Various studies have shown that CPR failure is high in many countries. This study was aimed to explore the barriers to the success of CPR from the perspective of Iranian nurses.
Methods: Participants were 14 Iranian nurses recruited through purposive sampling. In-depth semi-structured interviews were used to collect data. Data were analyzed using qualitative content analysis.
Results: The barriers to successful CPR were developed in three main categories and nine subcategories. Some of the barriers to CPR success were: "delayed attendance of the CPR team and start of CPR", "inadequate experience and skill of the CPR team", "poor access to special units", "insufficient and deficient CPR equipment", "poor CPR location", "critical clinical conditions of the patient", and "interference of the patient's family members.
Conclusion: The results showed that human and environmental factors can result in CPR failure. These barriers can be minimized by measures such as empowerment of the CPR team, and providing the necessary facilities and equipment.

1. Introduction

Sudden Cardiac Arrest (SCA) is a lethal condition in which the mechanical function of the heart comes to a sudden stop and requires emergency treatment. This condition may be reversible by performing appropriate interventions; otherwise, it can cause death [1,2]. CPR is one of the most significant innovations of the medical history that is used to prevent or postpone death in patients with SCA [3]. According to the recommendations of the American Heart Association (2015), performing CPR 3–5 min after cardiac arrest increases the survival rate by 50% [4]. The survival rate following in-hospital cardiac arrests has been reported to be 7–26.7%. A study reported the survival rates of 14.7%, 16%, and 12% for CPR in the U.S., the U.K., and Turkey, respectively [3]. The survival rate after CPR varies in different countries and is generally low [3,5]. Various studies have shown that CPR failure is high in many countries [4,5]. From the nurses' perspective, the most important causes of CPR failure include lack of coordination among the CPR team members, shortage of equipment and facilities, presence of the patient' family members during CPR, patient's clinical conditions, duration of CPR, insufficient knowledge and skill of CPR team, improper management of the CPR team, and individual characteristics of the CPR team, including mental problems and physical weakness [4,6–21]. Since in some countries, such as Iran, the nurses are responsible for initiating the CPR and performing basic life support until the CPR team arrives, it is necessary that they are informed of and follow the CPR rules [20]. Although the barriers to CPR are common in different hospital wards, the perceived barriers to CPR from the viewpoint of nurses are limited [22]. Hence, it seems necessary to investigate the barriers to CPR in order to adopt appropriate strategies to carry out successful CPR. Since there are very few qualitative studies on the barriers to successful CPR from the perspective of nurses, the present study was done to explore the barriers to the success of CPR from the perspective of Iranian nurses.

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2. Methods

2.1. Design

This qualitative study was conducted using the conventional qualitative content analysis approach, based on the Graneheim and Lundman method (2004) [23,24].

2.2. Selection and participants

Participants were 14 Iranian nurses recruited through purposive sampling from February 2019 to May 2019. In order to obtain rich information, participants were selected from among nurses of different wards, of both sexes, with different ages and work experience, and of different wards including Critical Care Unit (CCU), Intensive Care Unit (ICU), and emergency department [25].The inclusion criteria consisted of having a bachelor or master degree in nursing and having experience in doing a minimum of five cases of CPR. Sampling was continued until data saturation [25].

2.3. Setting

This study was done on nurses working in CCU, ICU, and emergency department of one of the subspecialized hospitals of Kermanshah, affiliated with Kermanshah University of Medical Sciences.

2.4. Data collection

Data were collected by in-depth semi-structured interviews with guiding questions [26]. The guiding questions were prepared using the views of the experienced nurses in the field of CPR, and previous studies. The interviews were conducted in a quiet place in Imam Reza hospital after making arrangements with the nurses and taking their consent. The interview was initiated by asking guiding questions such as "what are the factors influencing CPR?", "what factors cause CPR failure?", "what factors affect the CPR improvement?", "what is the role of human factors in the success of CPR?"," what is the role of human factors in the failure of CPR?", "what is the role of equipment and facilities in the success of CPR?", and "what is the role of equipment and facilities in the failure of CPR?". For more clarification, phrases like "why", "how", and "explain more" were used. The interview was continued until the saturation of data; i.e. when new data and classification were not found. In spite of data saturation in interview ten, four other interviews were conducted to be more confident in data saturation. The time of the interview was not fixed and was dependent on the interview trend, ranging from 20 to 40 min. The interviews were conducted by the first author, a woman with a master's degree in nursing and more than 15 years of experience in clinical practice.

2.5. Data analysis

In current study, conventional content analysis using Graneheim and Lundman (2004) method was used to analyze the data [23]. The analysis was done by the second, fourth and fifth authors. At the first step, after each interview, it was transcribed verbatim and read several times. In the second step, the meaning units were extracted from the text and were condensed and labeled. At this point, sub-categories were identified. In the third step, based on differences and similarities, the categories were extracted. In the final step, the latent meanings of the text, called main cores, were identified. To confirm the coding process, the transcriptions, codes, categories, and subcategories were submitted to the other research members and they approved the process. Also, to verify the credibility of the data, the codes were provided to three participants and confirmed by them.

2.6. Trustworthiness

In this study, the Lincoln and Guba's criteria were used to address trustworthiness [27]. The researcher made an attempt to increase the credibility of data by conducting in-depth interviews, making adequate interaction and cooperation with the participants, collecting credible data, and asking the participants to confirm the data. To increase the dependability of data in this study, an attempt was made to explain all study procedures so that the readers would make a correct judgment. To elevate the confirmability of the data, the researcher submitted the transcriptions, codes, categories, and subcategories to the other research members to confirm the coding process. To enhance the transferability of the research findings, an effort was made to make it possible for others to follow the research trend and characteristics of the study population by providing precise explanations about the research process and activities performed during the study.

2.7. Ethical considerations

The ethics committee of the university approved the study IR.KUMS.REC.1397.947. The study objectives were explained to all participants and informed written consent was taken from all of them. All participants were allowed to record their voices. The right of participants to withdraw from participation was reserved. Ethical considerations such as anonymity of participants and confidentiality of data were taken into account.

3. Results

A total of 14 nurses with a mean age of 34.1 ± 6.5 were recruited in this study. Eight of them were female and the other six were male. Seven nurses had a master degree and the other seven had a bachelor degree in nursing. The average work experience of participants was 13 years.

After doing the qualitative content analysis of the interviews, three main categories and nine subcategories were developed. The main categories included "barriers related to the CPR team", "barriers related to the equipment", and "barriers related to the patient". The subcategories consisted of "delayed attendance of the CPR team and timely start of CPR", "inadequate skill and experience of the CPR team", "individual characteristics of the CPR team "poor CPR location", " Inadequate and deficient CPR equipment", "poor access to special units", "critical clinical conditions of the patient", and "interference of the patient's family members"(Table 1).

3.1. Barriers related to the CPR team

The resuscitation team must have certain characteristics such as knowledge and skills, experience, and speed of action. In the opinion of

Table 1
Core category, categories and sub-categories of findings.

Core category	Categories	Sub-categories
Barriers to the success of CPR*	Barriers related to the CPR team	- Delayed attendance of the CPR team and timely start of CPR - Inadequate skill and experience of the CPR team - Individual characteristics of the CPR team
	Barriers related to the CPR equipment	- Poor access to the special units - Inadequate and deficient CPR equipment - poor CPR location
	Barriers related to the patient	- Critical clinical conditions of the patient - Interference of the patient's family members

[8]Cardiopulmonary resuscitation.

the participants, a barrier to CPR success was the barriers related to the CPR team. They emphasized the careful selection of the CPR team and the use of a sufficient number of qualified personnel. This category consisted of four subcategories, including "shortage of workforce", "delayed attendance of the CPR team and initiation of CPR", "inadequate skill and experience of the CPR team", and "individual characteristics of the CPR team".

3.1.1. Delayed attendance of the CPR team and timely start of CPR

A key step to CPR success is timely attendance and performance of the CPR team. All of the participants emphasized the role of speed of action in the success of CPR and mentioned the lack of attention to this issue as one of the important causes of CPR failure.

> "CPR has a generally low success rate in the world and depends on the speed of action of the CPR team. CPR means the speed of action. Hesitation in initiating the CPR means CPR failure." (Participant No.10)

The participants identified a shortage of nurses as one of the main reasons for the delay in initiating CPR.

> "Sometimes several patients may simultaneously need CPR in several separate wards. In these conditions, it takes a long time for the CPR team to make the conditions of one or two patients stable even if there are an adequate number of nurses. This postpones the nurses' attendance on the rest of the patients requiring CPR, so the CPR success will be reduced." (Participant No. 9)

3.1.2. Inadequate skill and experience of the CPR team

To select the CPR team members, their experience and skills must be taken into consideration. Failure to consider the above points was a factor some participants believed was involved in the failure of CPR.

> "An experienced nurse may understand more rapidly than a novice nurse that a patient needs CPR, but a novice nurse may understand this later." (Participant No. 2)

Another factor that contributed to the success of CPR was the sufficient knowledge and skills of nurses in the use of resuscitation equipment such as defibrillators.

> "CPR is a practical skill and a nurse with no experience of working with CPR equipment definitely makes the CPR problematic." (Participant No. 9)

3.1.3. Individual characteristics of the CPR team

Some characteristics of the CPR team such as personality traits can influence the CPR outcome. The participants believed that the responsibility of the resuscitation team played a role in the success or failure of CPR.

> "Some nurses are quire carefree. I had a patient with successful CPR, but after I submitted the patient to my carefree colleague, the patient conditions worsened some minutes later." (Participant No. 2)

The participants referred to the role of gender in relation to the individual characteristics of the resuscitation team and considered the use of men to be effective in the success of CPR, citing the greater physical strength of men in performing long-term cardiopulmonary massage.

> "Men are stronger than women in heart massage, and women are not able to apply the force needed on the patient's chest although they know about the massage principally." (Participant No. 6)

Stress and anxiety has various negative effects and can lead to failure in making decisions and cause delayed performance. The participants emphasized the importance of the resuscitation team's mental health, citing stress and anxiety as causes of CPR failure.

> "A nurse may have anxiety and stress and may not be able to undertake stressful situations. This person is not suitable for CPR and is not able to take such a situation. Presence of such people in the CPR team endangers the life of the patients." (Participant No. 12)

3.2. Barriers to the CPR equipment

Barriers to the CPR equipment was another main category that most of the participants reported as a key factor involved in CPR failure. This category consisted of the subcategories "poor access to the special units", "inadequate and deficient CPR equipment", and "inappropriate CPR location".

3.2.1. Poor access to the special units

Difficult access to hospital wards can lead to CPR failure. The participants stated that the presence of deficient and small elevators, too many stairs, and narrow and crowded staircases made it difficult to access the patients requiring CPR.

> "When the CPR team is paged, they most often have to use the stairs, which kills a lot of time." (Participant No. 8)

Participants considered the ease of access to SCA patients as an important factor in the success of CPR and stressed the need to allocate dedicated routes for the resuscitation team.

> "While doing CPR, the only system of access to patients is an elevator. The small and deficient elevators naturally postpone the attendance of the CPR team and using the stairs also wastes the time." (Participant No. 4)

3.2.2. Inadequate and deficient CPR equipment

Inadequate and deficient CPR equipment was another barrier to CPR success in the opinion of Participants. They stressed the importance of having adequate equipment such as ambu bag, laryngoscope, and ventilator. The Participants believed that the necessary equipment should be available to the rehabilitation team.

> "The necessary CPR equipment such as ambu bag, oxygen capsule, and endotracheal tube must exist in the ward as much as needed and a nurse has to make sure they exist in sufficient number and work properly. Deficient ambu bag or disproportionate size of the endotracheal tube can cause CPR failure." (Participant No. 2)

The participants cited a technical defect in resuscitation equipment as one of the causes of CPR failure and stressed the need to check the equipment in each shift.

> "Defibrillator is the most important device for CPR. If it is deficient or works improperly, CPR will fail." (Participant No. 3)

3.2.3. Poor CPR location

Participants identified the appropriateness of the CPR site as a prerequisite for successful resuscitation. They believed that the small size of the CPR room was involved in CPR failure.

> "In the ward, we have 3–4 beds in each room. When we want to perform CPR, we practically have a shortage of space since there must be 6–7 nurses in the CPR team, which can affect the CPR outcome." (Participant No. 2)

CPR requires a lot of space to easily accommodate the resuscitation team, and equipment such as defibrillator and emergency trolley.

> Taking a CPR trolley to some rooms is difficult. There is usually a monitor or ventilator in the room of a patient for whom a code is

determined. There are also several members in the CPR team. All these conditions can cause limitations in the room space, thereby minimizing the efficiency of the CPR team." (Participant No. 13)

3.3. Barriers related to the patient

Barriers related to the patient was another category that all of the participants reported as an important factor involved in CPR failure. This category consisted of the two subcategories "critical clinical conditions of the patient", and "interference of the patient's family members".

3.3.1. Critical clinical conditions of the patient

The participants believed that patients' critical conditions can negatively affect CPR results. They considered the poor physical condition of patients, especially patients with insufficiency of important organs, as one of the causes of CPR failure.

"The CPR results of a patient with different coagulation, renal, and cardiac disorders are certainly different from those of a patient with better clinical conditions." (Participant No. 13).

Old age was reported as one of the risk factors resulting in failed/ineffective CPR.

"Older patients usually suffer from pulmonary heart failure, which reduces the possible success of CPR." (Participant No. 2)

3.3.2. Interference of the patient's family members

Anxiety and emotional reactions in the patient's companions and their interference in the CPR process may confuse the CPR team while doing their job. Some participants reported the interference of the patient's family members as a factor involved in CPR failure.

"A barrier to CPR is a crowd of the patient's companions while doing CPR, especially in the case of the pediatric patients, which causes stress in the CPR team and distracts their concentration." (Participant No. 4)

The participants believed that gathering of patient's companions in front of the CPR room would prevent the resuscitation team from interacting with each other and their access to the equipment and supplies needed.

"The patient's companions gather in front of the CPR room during CPR, which makes the movement of the CPR team and transportation of necessary CPR equipment, including trolley, into the room difficult." (Participant No. 9)

4. Discussion

This study was aimed to explain the barriers to CPR success from the viewpoint of nurses. From the perspective of nurses, a shortage of manpower was a factor associated with CPR failure. The results of a study (2017) on Iranian nurses indicated that an adequate number of CPR members can affect the CPR outcome [8]. In a study conducted in India aiming at identifying the barriers to CPR, most participants asserted the number of nurses was disproportionate to their workload [28]. Given the undeniable role of manpower in the improvement of healthcare services, it seems essential to perform a proper distribution of forces based on the workload and patients' conditions. One of the barriers to CPR success was delayed the arrival of the CPR team. According to the American Heart Association, if proper care is provided to the patients during the first 3–5 min of cardiac arrest, the survival rate will increase by 50%. On the other hand, the success rate is reduced by 7–10% per each minute delay in defibrillation [3]. It is evident that untimely attendance of the CPR team can increase the mortality rate and cause consequences like irreversible physical harm. Another barrier to CPR was inadequate skill and experience. Since nurses are responsible for starting the CPR and providing basic life support until the CPR team arrives, it is necessary that nurses have adequate skills and experiences [10]. The results of a study showed the nurses' skill was a factor that affected the CPR success [15]. The CPR team includes different people with various specialties, each has to possess sufficient competence in their specialty. In the meantime, nurses as a member of the CPR team, due to having more interaction with patients, have a significant role. Empowerment of the CPR team through organizing regular training programs was a strategy the participants suggested for increasing the CPR success. Hunziker et al. showed training the CPR team increased the success of CPR [29]. CPR has a theoretical and practical nature, some parts of which can be taught virtually and via the web. The results of a study in Iran indicated the efficacy of online training in enhancing the knowledge of nurses [30]. It is evident that the knowledge and skill of the CPR team influence the CPR outcome [15,18]. Hence, organizing periodic CPR courses plays a positive role in the CPR outcome [10].

The individual characteristics of the CPR team, including mental problems, such as stress and physical weakness, have been proposed as barriers to CPR success. The medical emergency conditions can change into stress and fear, which in turn influences an individual's performance. Sandroni & Quilici reported even running CPR training courses is stressful [31,32]. The results of a study in Sudan showed CPR in real conditions is stressful even for the trained and professional personnel [33]. Stress has various negative effects and can lead to failure in making decisions and cause delayed performance [31,32].

Another individual characteristic proposed as a barrier to CPR success was physical weakness. The findings of Case et al. indicated that the CPR personnel reported physical weakness and thinness as important barriers to patient transfer and doing the required activities [9]. The authors of the present study believe a balance between the mental and physical features of the CPR nurses and their professional duties can play a significant role in the CPR success, which must be taken into account while selecting the CPR team members. In the opinion of nurses, insufficient and deficient CPR equipment was another barrier to CPR success. The results of a qualitative study in Iran indicated a shortage of proper CPR equipment minimized the self-confidence of the CPR team, which could lead to CPR failure [13]. The findings of Vail et al. showed lack of access to necessary CPR equipment prevented the provision of immediate patient care and CPR success [28]. To do away with this problem, it is better in each work shift one of the CPR members monitor all CPR equipment and report the deficiencies and shortcomings to the CPR team. Lack of appropriate space for CPR and difficult access to patients were other barriers to CPR. Evidence indicates that lack of proper space and location is a factor associated with CPR failure [7,28]. Considering the number of CPR team members and the space required for the CPR equipment, including trolley, defibrillator, and ventilator, lack of space was proposed as a barrier to CPR. Another factor involved in the CPR failure was critical clinical conditions of the patient. Evidence shows that the patient's clinical condition is an influential factor in CPR success [16]. The physical conditions of the patient, can predict the survival of the patients requiring CPR. For instance, the odds of CPR success are lower in patients with brain stroke than in other patients [6]. In a study on the experience of CPR rescuers in Iran, the clinical conditions of the patient were found to be a factor influencing the CPR outcome so that the patients with cardiovascular and brain diseases had a lower chance of survival after CPR [8].

From the viewpoint of the nurses, another factor involved in the CPR failure was the interference of the patient's family members in the CPR process. Participation of the patient's family members in the common healthcare services can increase patient satisfaction. However, there are disagreements among the healthcare providers regarding the presence of the patient's family members during CPR [21]. In this regard, European health care professionals disagree with the presence of the

patient's family members during CPR. Disrupted patient care and possible emotional and mental harms to the patient's family members are reasons for disagreement over the presence of the patient's family members during CPR [17].

Like other qualitative studies, the present study faced the problem of generalizability of data. However, the researchers tried to adopt strategies such as selecting the participants from among a wide age range and different work experiences, conducting in-depth interviews, and sufficient interaction with the participants to minimize this limitation. Another limitation of the current study was selecting the participants from among the nurses, while the CPR team includes other professionals, too.

5. Conclusion

The findings of this study indicated that several factors affect the outcome of CPR. Many of these factors such as delayed attendance of the CPR team, inadequate skill of the CPR team, and inadequate and deficient CPR equipment can be reduced or eliminated. In the meantime, paying attention to the empowerment of nurses of the resuscitation team, and providing the necessary equipment and facilities, is of particular importance. It is suggested that in future studies, barriers to CPR success be explained from the perspective of other resuscitation team members.

Authors contributions

Maryam Janatolmakan, Roghayeh Nori, Ali Soroush, Bahare Andayeshgar, Alireza Khatony MJ, RN, AS, BA, and AK contributed in designing the study. MJ and RN collected the data, and analyzed by AK, RN, and BA. The final report and manuscript were written by MJ, RN, AS, BA, and AK. All authors reviewed and approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics approval and consent to participate

The study was approved by Ethics Committee of Kermanshah University of Medical Sciences with code IR.KUMS.REC.1397.947. The written informed consent was obtained from all the participants.

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