



Correlation between Success Rates of Cardiopulmonary Cerebral Resuscitation and the Educational Level of the Team Leader; A Cross-Sectional Study

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ABSTRACT

Objectives: To determine the correlation between the success rates of the cardiopulmonary cerebral resuscitation (CPCR) and the team's leader education and skill level in Shiraz, southern Iran.

Method: This cross-sectional study was conducted during a 6-month period from October 2007 to March 2008 in Nemazee hospital of Shiraz. We included all the patients who underwent CPCR due to cardiopulmonary arrest in emergency room of Nemazee hospital during the study period. We recorded the rates of return of spontaneous circulation (ROSC) and discharge rate (DR) of all the patients. The correlation between these two parameters and the team leader's education and skill level was evaluated.

Results: Overall we included total number 600 patients among whom there were 349 men (58.1%) and 251 (41.8%) women with mean age of 58.9±42.6. We found that 270 (45.1%) patients had ROSC, while 330 (54.9%) patients died. Overall 18 (6.6%) patients were discharged from hospital (3% of all participants). We found that the ROSC was significantly higher in those with specialist leader (anesthesiologist or pediatrician) when compared to those in whom CPCR was conducted by technicians (55.2% vs. 30.7%; $p=0.001$).

Conclusion: Conducting CPCR by persons with higher medical degrees resulted in higher rate of ROSC but not in more discharge rate. In spite of the fact that the rate of ROSC following CPCR was closely analogous to that of developed countries, discharge rate was lower. This indicates that in our region, much more attention needs to be paid to post-resuscitation care and organizing training programs and to cover more resuscitation by CPCR team, conducted by the specialists.

Keywords: Cardiopulmonary cerebral resuscitation (CPCR); Team leader; Return of spontaneous circulation (ROSC); Discharge rate (DR).

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Introduction

The incidence of inpatient cardiopulmonary arrest requiring cardiopulmonary cerebral resuscitation (CPCR) is approximately 1 to 5 events per 1000 hospital admissions annually [1], with a survival to hospital discharge rate (DR) of 0 to 42% [2]. The outcome of CPCR depends on various parameters including, age of patients, comorbidities, time and location of cardiopulmonary arrest, and conductor's skills and competencies [3]. The status of CPCR including optimal depth of chest compression is an essential key for successful resuscitation [4]. The outcome of the CPCR is directly associated with effective leadership [5-8]. Thus the team leader skills and level of education is an important indicator of patients' outcome after CPCR. Accordingly, the European Resuscitation Council (ERC) and the American Heart Association (AHA) recommend training skills for those performing as leaders of CPCR teams [9,10]. Currently different guidelines and training programs are available for healthcare workers. Despite all of these programs, the outcome of CPCR has remained poor [11,12]. Observational studies on cardiac arrest revealed significant shortcomings in the performance of rescuers, which may partly explain the poor outcome of CPCR [13,14]. For instance, CPR is frequently interrupted and the chest compression is performed too slowly, resulting in suboptimal hands-on times and low CPR quality [13,14]. Although resuscitation guidelines provide a logical, sequential algorithmic approach, they have mainly emphasized technical tasks performed by individual rescuers and have not addressed issues of adapting to the complex nature of most actual resuscitations. Part of this complexity relates to the fact that in a healthcare environment resuscitations are usually performed by teams of responders, not by isolated rescuers. The aim of the current study is to determine the correlation between the CPCR team leader and the outcome of the patient in Shiraz, southern Iran.

Materials and Methods

Study Population

This cross-sectional study was conducted during a 6-month period from October 2007 to March 2008 in Nemazee hospital, a tertiary general healthcare center affiliated with Shiraz University of Medical Sciences. Nemazee hospital with 750 beds and approximately 25000 admissions per year is the biggest referral health care center in southern Iran. The approval of both institutional review board (IRB) and medical ethics committee of Shiraz University of Medical Sciences was achieved before the study. No informed written consents were required as we recorded the outcome of the CPCR without any intervention. We included all the patients who developed cardiopulmonary arrest in the hospital

during the study period and underwent CPCR by different teams. Those who were brought to the hospital with cardiopulmonary arrest, outpatient cardiopulmonary arrest and dead on arrival patients were excluded from the study.

Study Protocol

The baseline characteristics of all the included patients as well as the comorbidities and underlying conditions were recorded. The members of all the included CPCR teams were recorded. In order to evaluate the outcome of CPCR, two approved continuums of return of spontaneous circulation (ROSC) and discharge rate (DR) were recorded. ROSC denotes the successful cardiopulmonary cerebral resuscitation as the very early outcome of resuscitation while DR indicates the short term outcome [1]. The educational level of the CPCR team leader was also recorded in all the cases.

Statistical Analysis

All the statistical analyses were performed using statistical package for social sciences (SPSS Inc, Chicago, IL, USA) version 15.0. Data are presented as mean \pm SD and proportions as appropriate. The CPCR outcome was compared between different levels of education using the chi-square and Fisher's exact test. A 2-sided p-value of less than 0.05 was considered statistically significant.

Results

Overall we included a total number of 600 patients undergoing CPCR due to cardiopulmonary arrest during the study period. There were 349 men (58.1%) and 251 (41.8%) women with mean age of 58.9 ± 42.6 (ranging from 1 to 82) years (Figure 1). CPCR was conducted by different numbers of staff. In 1.4% of cases it was conducted by one or two emergency medical staff, 5.6% by three, 53% by four, 37.6% by five, and 2.2% by more than 5 people. There was no statistical significant difference between ROSC or DR and the number of staffs participating in CPCR ($p=0.423$). The CPCR was performed in ICU in 158 (26.3%) of patients while 443 (73.6%) patients developed cardiopulmonary arrest in wards. The ROSC was significantly higher in those who received CPCR in ICUs when compared to wards (51% vs. 22.5%; $p=0.002$).

We found that 271 (45.1%) patients had ROSC (47.9% of men and 42.5% of women) while 329 (54.9%) patients died in spite of resuscitation. Among those who survived, 18 (6.6%) patients were discharged (3% of all participants). The DR was 3.1% in men (11 patients) and 2.9% in women (7 patients). The ROSC ($p=0.153$) and DR ($p=0.539$) was comparable between men and women. We found that the rate of ROSC was significantly higher in those younger than 60 years when compared to those older than 60 ($p<0.001$). However the DR was comparable

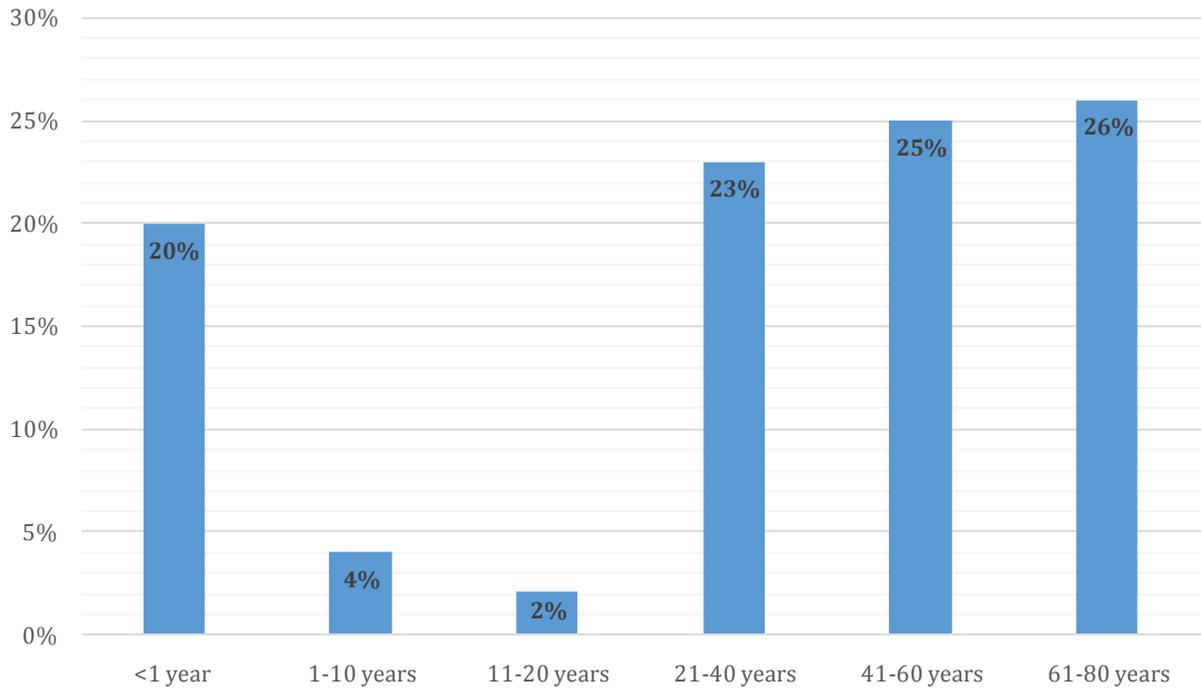


Fig. 1. Age distribution of 600 patients undergoing CPR during the study period.

between different age groups (Figure 2).

The duration of CPR was less than 10 minutes in 46 (7.6%) patients, 10-20 minutes for 98 (16.4%) patients, 20-30 minutes for 292 (48.6%) patients, and >30 minutes for 164 (27.4%) patients. ROSC was significantly higher in those receiving CPR more than 30 minutes and those with less than 30 minutes duration of CPR (53.7% vs. 17.4%; $p < 0.001$). The DR was not significantly different between these two

groups (Figure 3).

The CPR team was led by an intern in 84 (14%) patients by a resident in 160 (26.7%) patients, by a specialist (anesthesiologist or pediatrician) for 38 (6.3%) patients, by an anesthesia technician (two year trained in anesthesia or trained nurses for CPR) for 279 (46.5%) patients, and by a medical wards staff for 39 (6.5%) patients. The ROSC was significantly higher in specialist group when

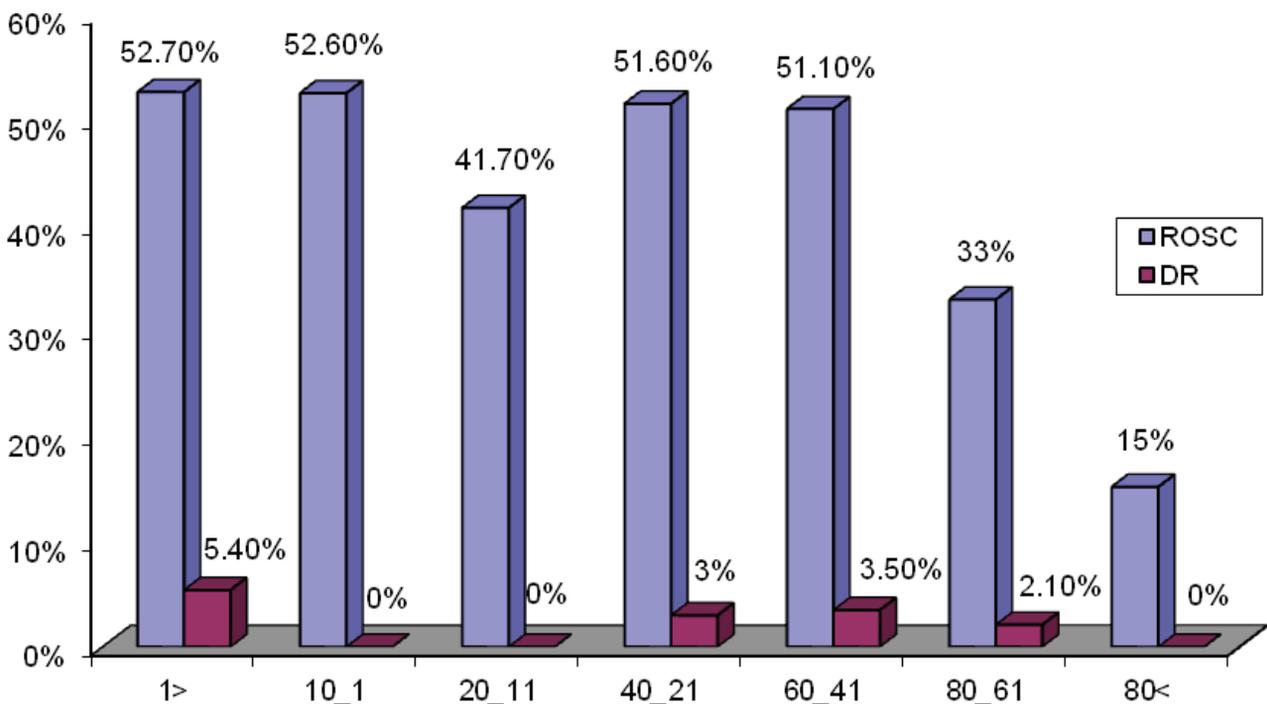


Fig. 2. The return of spontaneous circulation and discharge rate in 600 patients with cardiopulmonary arrest undergoing CPR according to the age group.

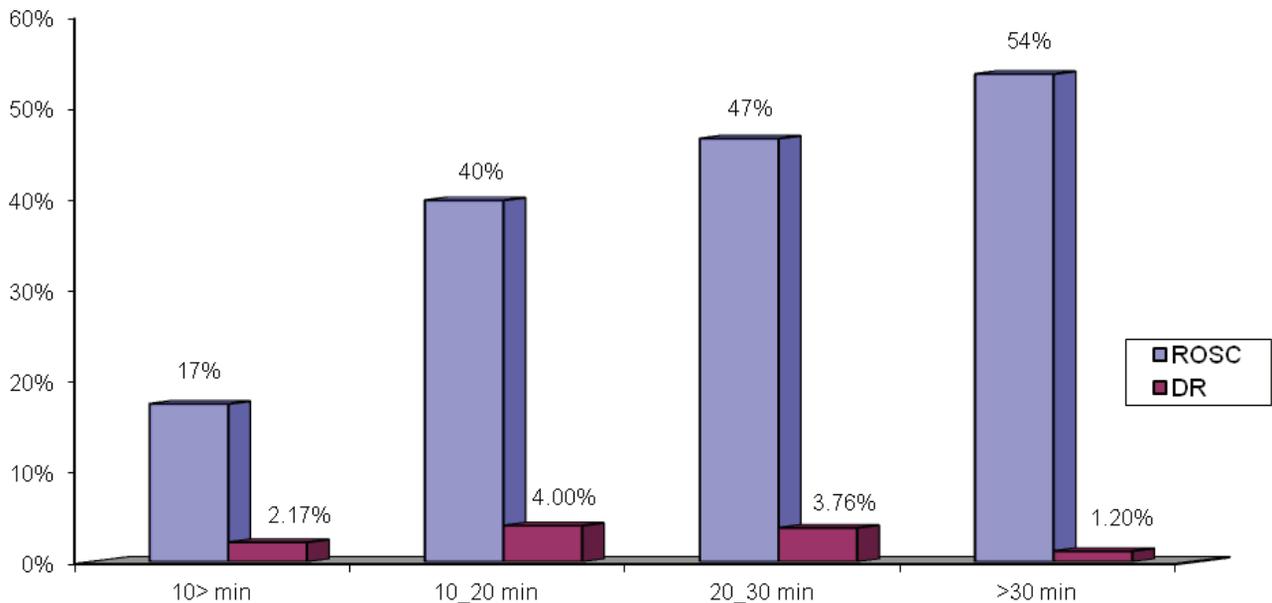


Fig. 3. The return of spontaneous circulation and discharge rate in 600 patients with cardiopulmonary arrest undergoing CPR according to the duration of CPR.

compared to medical wardstaff (55.2% vs. 30.7%, $p=0.032$). The discharge rate was comparable between two study groups (Figure 4).

Discussion

As the leadership is a key element in conducting a successful CPR, we performed the current study in order to determine the effects of team leader's educational level on the outcome of CPR. We found that ROSC and DR were 45.1% and 3% demonstrating improvement compare to previously reported rates in the same center [11,12]. We have previously reported the ROSC of 10.6% and DR of 0.4% in Nemazee hospital during 2006 [11,12]. In Iran,

the ROSC and DR ranges from 4.18% to 29.3% and 0-10%, respectively [15]. It seems that ROSC in our center is higher but DR is lower than some previously reported studies.

In our region, the rate of ROSC following CPR is close to the range of other countries such as USA (44%), Portugal (30%), Australia (73%), UK (38.6%) and Thailand (61.7%) [16]. It is assumed that 25-67% of patients having ROSC will die on the first day and they can never be discharged from hospital. Reported DR has fluctuated from 0 to 42% worldwide, with the majority being around 20% [17]. Our DR results showed as even fold increase compared with previous reported rates from our center and other center in developing countries

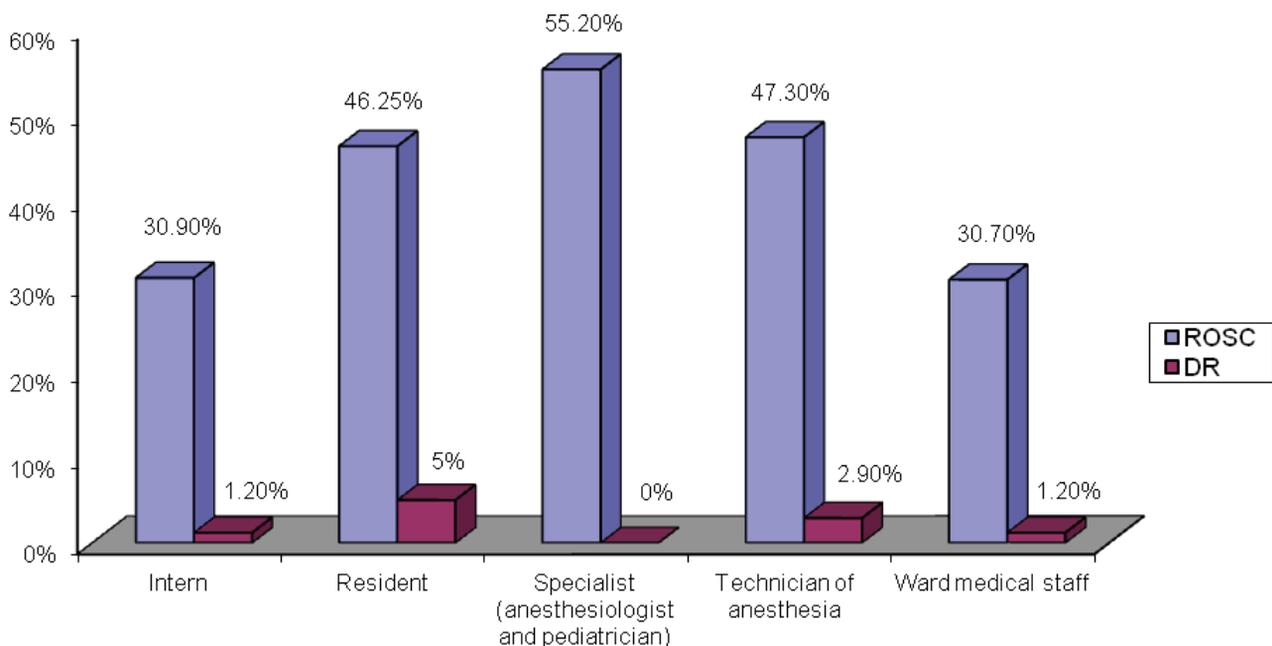


Fig. 4. The return of spontaneous circulation and discharge rate in 600 patients with cardiopulmonary arrest undergoing CPR according to team leaders' educational level.

[11,12,18]. This significant improvement results from planned programs in Nemazee Hospital including more comprehensive training courses for emergency medical staff, nurses, and anesthesia technicians, increasing ICU beds by 37%, and settling down the place of CPR trained staff where resuscitation seems to be higher. Also, teams are provided with and trained to use modern tools.

In our study, consistent with many previous studies, there is no relationship between gender and ROSC or DR [17,18]. We found a reverse relationship between age and the chance of ROSC; that is as age increases ROSC decreases. This is consistent with previous reports [15,18] although some other investigations have denied such a relationship [19]. The difference could be due to the inclusion criteria and the study design. Some studies include only adults or children while other such as our study includes all the individuals in a general hospital. Above all, "Do not resuscitate" signs was seen more frequently above older patients' beds. In our study, patients having at least one prior CPR had a higher chance of ROSC. Such special sub groups of patients were most likely to be accepted in ICUs where high quality CPR could be started instantly. No increase in DR was seen in this group because of more comorbidities and critical situations. On the other hand, ROSC rate was higher in ICU patients compared with other hospital wards [15,18,20]. It is probably because of earlier detection, more effective and appropriate care of patients, instant access to equipments, and as mentioned earlier, the possibility of applying high quality CPR.

We also found that patients receiving CPR duration was more than 30 minutes had the least chance to survive and hospital discharge (0.6%). Refractory underlying cause of arrest and inappropriate method of resuscitation may be the contributing causes, although the ultimate reason is long lasting hypoperfusion and hypoxia [21].

The rate of ROSC and DR was not associated

with the number of staff involved in the CPR process. So it seems to be much more important to focus on personnel's expertise and their availability instead of the numbers since special is that the highest rate of ROSC in our study. Thus the team leader's educational and skill level was the most important predictor of having higher ROSC rate. The DR was not associated with neither the team leader educational level, nor the number of team members. In our study, at the end of resuscitation, a ventilator was available for 37.5% of patients and not instantly on hand for 62.5% of the patients. The lack of accessibility to ventilator in early post-CPR period may be an important factor for the low DR in our study, which needs further investigations.

An emergency leadership training program is essential to enhance the performance of leaders and their teams [2]. Other studies have also revealed that residents have deficits in their training and supervision to care for critically ill patients as cardiac arrest team leaders. This raises sufficient concern to prompt teaching hospitals and medical schools to consider including more appropriate supervision, feedback, and further education for residents in their role as leaders of cardiac arrest teams [22].

In conclusion, conducting CPR by persons with higher medical degrees, resulted in higher rate of ROSC but not in higher DR. In spite of the fact that the rate of ROSC following CPR was closely analogous to that of developed countries, discharge rate was lower. This indicates that in our region, much more attention needs to be paid to post-resuscitation care and organizing training programs and to cover more resuscitation by CPR team, conducted by the specialists.

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Conflict of Interest: None declared.

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