

Cardiopulmonary Arrest Outcome in Nemazee Hospital, Southern Iran

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Abstract

Background: Many factors are important determinants in the outcome of cardiopulmonary resuscitation (CPR) such as quality of CPR, age of patients, co morbidities, time and location of arrest, and skill of rescuers. This study was conducted to evaluate the efficacy of CPR in Shiraz, southern Iran.

Methods: From October 2007 to March 2008, all patients who received in-hospital CPR in Nemazee Hospital affiliated to Shiraz University of Medical Sciences were enrolled. Two standard scales of ROSC (Return of Spontaneous Circulation) and DR (Discharge Rate) were used to evaluate the efficacy of CPR.

Results: Two hundred and seventy one patients (45.1%) had ROSC while 329 (54.9%) died immediately after resuscitation. Among ROSC patients, 18 (6.6%) cases were discharged from the hospital (3% of study population).

Conclusion: Although ROSC was comparable with developed countries, but the DR was lower. It shows that in our area, post-resuscitation care needs more attention in relation to organized trainings and the skills in post-resuscitation care together with expansion of the facilities.

Keywords: Cardiopulmonary resuscitation; Survival Rate; In-hospital arrest

Introduction

Undoubtedly, the cardiopulmonary resuscitation (CPR) plays an important role in medicine. Many experts believe that most victims of cardiopulmonary arrest will survive if the interventional factors of early access, CPR, defibrillation and advance care happen as soon as possible.¹

In-patient cardiopulmonary arrest is common with the rate of about 1-5 events per 1000 hospital admissions annually² but the survival to hospital discharge rate is 0-42%.³ This discrepancy simply shows the effect of many factors on ultimate results of resuscitation. Many factors such as quality of CPR, age of patient, co morbidities, time and location of arrest, bystander witnessed arrest, cardiac rhythm and skill of rescuers are

important determinants of resuscitation results.⁴⁻⁸ Quality of CPR including optimal depth of chest compression is a key for successful resuscitation,⁹ although substandard CPR with shallow chest compression and hyperventilation is common in advanced life support.⁸

Association between age and survival has controversies while some reported no correlation between age and survival after cardiac arrest,¹⁰⁻¹² and some noticed a low survival rate in old victims of the arrest.^{13,14} Although some clinical conditions such as sepsis, renal failure, cancer or stroke worsen the prognosis of patients and lessen the survival to discharge,^{15,16} but these factors can not completely explain the outcome of arrests.² There are many controversies about the role of hospital location in survival of patients. Some studies demonstrated that patients in ICUs or ER had more survival chance¹⁰ while others reported opposite results.¹¹ These discrepancies may be extended to the time of arrest, cardiac rhythm, staff skills and many other factors.¹⁷⁻¹⁹

Boland-parvaz *et al.* reported on the need for

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Received: January 10, 2009 Accepted: July 5, 2009

changes in CPR strategies in Nemazee Hospital.²⁰ So this study was conducted to evaluate the efficacy of CPR in Shiraz, southern Iran after implementing some changes in equipments and educating of the personnel.

Materials and Methods

From October 2007 to March 2008, all patients who received in-hospital CPR in Nemazee Hospital affiliated to Shiraz University of Medical Sciences in Shiraz, southern Iran were enrolled. Nemazee Hospital with 540 beds and about 25000 annual admissions is a referral center in southern Iran. Data were recorded daily by trained interviewers as described by Bolandparvaz *et al.* until discharge or death of patients.²⁰

Two standard scales of ROSC (Return of Spontaneous Circulation) and DR (Discharge Rate) were used to evaluate the CPR efficacy. ROSC expresses successful cardiopulmonary resuscitation as immediate outcome of resuscitation while DR denotes to the short term outcome.² If a patient experienced several cardiac arrests, only the first in-hospital CPR was considered.

The study was approved by the Ethics Committee of Shiraz University of Medical Sciences. SPSS software was used for statistical analysis (version 13, Chicago, IL, USA) including Chi Square and Fisher Exact tests. A P-Value<0.05 was considered significant.

Results

Resuscitation was attempted for 600 patients including 349 males (58.1%) and 251 females (41.8%), ranging from >1 to <80 years old (Figure 1). Two hundred and seventy one patients (45.1%) had ROSC (47.9% of males and 42.5% of females) while 329 (54.9%) died immediately after resuscitation. among 271 survived patients, 18 (6.6%) cases were discharged from hospital (3% of the study population). The discharge rate was 3.1% (11 cases) and 2.9% (7 cases) in males and females respectively and the difference was not statistically significant between both sexes in ROSC or DR.

There was a significant difference in ROSCs in relation to the age ($p<0.001$). ROSC was higher in children less than 11 years old in comparison to other age groups (Figure 2). There was no statistically difference in relation to DR in different age groups ($p>0.05$; Figure 2).

Twenty percent of patients had previous history of resuscitation among them 75 (15 cases) had ROSC ($p<0.05$) but in relation to DR, the difference was not statistically significant.

In relation to CPR maneuvers, one or two emergency medical staffs performed 1.4% of the maneuvers; 3, 5.6%; 4, 0.53%; 5, 37.6% and more than 5, 2.2% of the maneuvers. There was no statistical

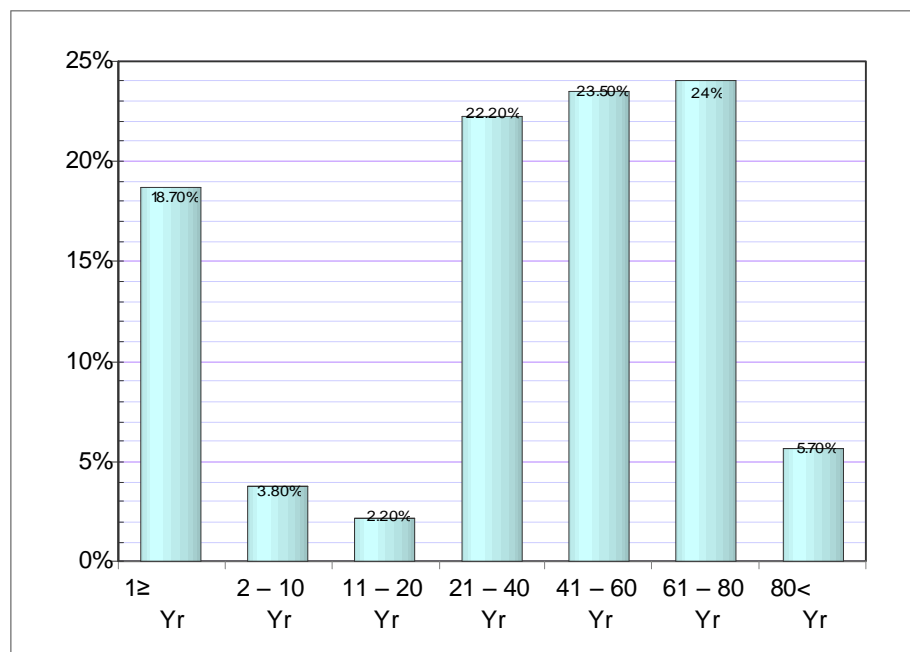


Fig. 1: Frequency of patients in different ages underwent resuscitation

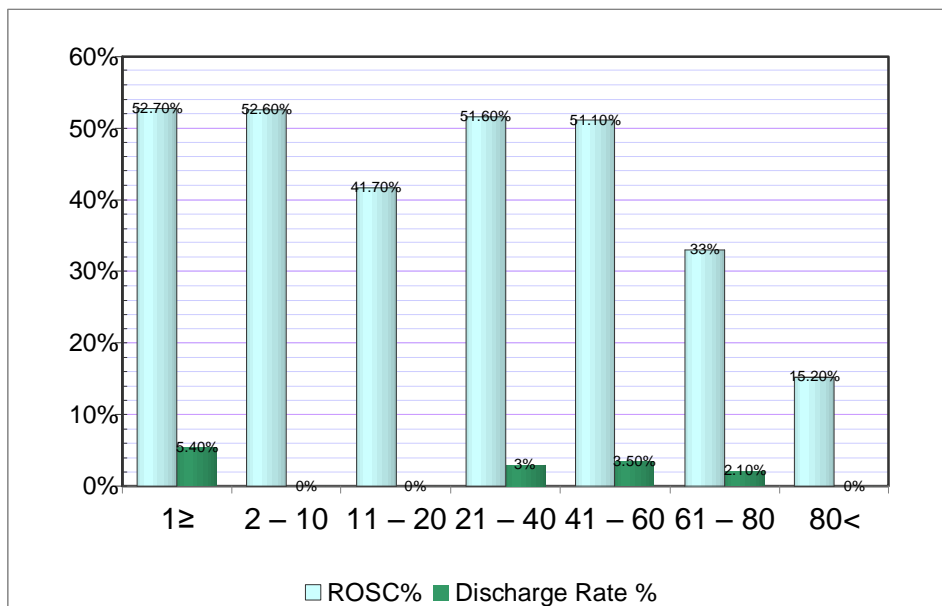


Fig. 2: DR and ROSC in different age groups after resuscitation

significant difference between ROSC and DR regarding the number of staffs participating in CPR. 26.3% (158 patients) were admitted in Intensive Care Units (ICU) and 73.6% (442 patients) in other wards. ROSC occurred in 51% of ICUs patients and 22.5% of other wards and the difference was statistically significant ($p < 0.05$). These figures for DR were 3.2% and 2.9% respectively and the difference was not significant.

Discussion

In our study, ROSC and DR were 45.1% and 3% showing a promotion in comparison to Boland-parvaz *et al.*'s study in 2006. They reported a ROSC of 10.6% and DR of 0.4% that were significantly lower than these results ($p < 0.05$). There are several other reports in Iran for ROSC and DR showing a range of 4.18%-29.3% and 0-10% respectively.²¹⁻²⁴ It seems that ROSC in our center is higher but DR is lower than some of those studies.

In our setting, ROSC is almost in line with others such as USA (44%), Portuguese (30%), Australia (73%), UK (38.6%) and Thailand (61.7%).^{13,25-28} It is believed that 25% to 67% of patients with ROSC will expire during the first day and never be discharge from hospitals. The hospital discharge rate (DR)

ranges from 0% to 42% universally but, most of them are near to 20%.¹⁰ Our DR results show a promotion even seven times more than Bolandparvaz *et al.* in 2006, but our result (3%) is still far from developed countries^{10,13,15,25,27,29,30} ($p < 0.02$).

This achievement is probably due to some key improvements in Nemazee Hospital including implementation of more comprehensive training courses for emergency medical staffs, nurses and CPR teams, equipment and training of the teams with modern tools, locating CPR teams where cardiopulmonary arrest incidence seemed to be higher and increasing of ICU beds up to 37%. In this study like majority of other studies, there is no relation between sex and ROSC or DR.^{10,13,18,28}

We are in agreement with studies expressing that meanwhile age increases, the chance of ROSC will decrease,^{13,14} but some studies are against this opinion.^{12,18,28} This disagreement maybe due to study design and inclusion criteria.² Some studies enrolled only adults or children, also "do not attempt resuscitation" label was seen more frequently above older patients' beds. In this study, patients with at least one previous CPR had more chance of ROSC. This group of patients were most likely to be admitted in intensive care units where high quality CPR could be started immediately. No more DR was seen in this group due to more co morbidities and critical conditions.

On the other hand, ROSC was seen more in ICU patients comparing other hospital's location that is in line with others.^{10,17,18,28} It is probably due to more efficient and accurate surveillance of patients, immediate availability of essential equipments and as mentioned, possibility of implementation high quality CPR.

It seems that patients with CPR duration longer than 30 minutes had the least chance of survival to discharge (0.6%). Refractory underlying cause of arrest, wrong method of resuscitation may cause this but the noticeable reason is long lasting hypoperfusion and hypoxia.² It seems that involving more medical staffs in CPR maneuver will not cause more ROSC or DR. So it is superior to focus on expertise of personnel and their availability instead of their numbers. In present study, at the end of resuscitation, a ventilator was available for 37.5% of cases but for 62.5% of cases ventilator was not immediately on hand. Although no significant difference in ROSC or

DR regarding ventilator availability was shown ($p>0.05$) but more investigation is recommended.

In Nemazee Hospital after cardiopulmonary arrest or ROSC, immediate survival had a significant improvement during a two years span (10.6% versus 45.1%). Our ROSC is comparable with developed countries, but the DR is still lower. Therefore, post-resuscitation care needs more attention to organized trainings and the skills in post-resuscitation care together with expansion of the facilities.

Acknowledgement

The authors wish to thank Shiraz University of Medical Sciences for their support.

Conflict of interest: None declared.

References

- Cummins RO, Ornato JP, Thies WH, Pepe PE. Improving survival from sudden cardiac arrest: the "chain of survival" concept. A statement for health professionals from the Advanced Cardiac Life Support Subcommittee and the Emergency Cardiac Care Committee, American Heart Association. *Circulation* 1991; **83**:1832-47. [2022039]
- Sandroni C, Nolan J, Cavallaro F, Antonelli M. In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival. *Intensive Care Med* 2007; **33**:237-45. [17019558] [doi:10.1007/s00134-006-0326-z]
- Abe T, Tokuda Y, Ishimatsu S; SOS-KANTO study group. Predictors for good cerebral performance among adult survivors of out-of-hospital cardiac arrest. *Resuscitation* 2009; **80**:431-6. [19185409] [doi:10.1016/j.resuscitation.2008.12.010]
- Eisenberg MS, Psaty BM. Defining and Improving Survival Rates From Cardiac Arrest in US Communities. *JAMA* 2009; **301**:860-2. [19244194] [doi:10.1001/jama.2009.193]
- Steen PA, Kramer-Johansen J. Improving cardiopulmonary resuscitation quality to ensure survival. *Curr Opin Crit Care* 2008; **14**:299-304. [18467890] [doi:10.1097/MCC.0b013e3282f827d3]
- Leary M, Abella BS. The challenge of CPR quality: improvement in the real world. *Resuscitation* 2008; **77**:1-3. [18325434] [doi:10.1016/j.resuscitation.2008.02.005]
- Peberdy MA, Ornato JP, Larkin GL, Braithwaite RS, Kashner TM, Carey SM, Meaney PA, Cen L, Nadkarni VM, Praestgaard AH, Berg RA; National Registry of Cardiopulmonary Resuscitation Investigators. Survival from in-hospital cardiac arrest during nights and weekends. *JAMA* 2008; **299**:785-92. [18285590] [doi:10.1001/jama.299.7.785]
- Olasveengen TM, Vik E, Kuzovlev A, Sunde K. Effect of implementation of new resuscitation guidelines on quality of cardiopulmonary resuscitation and survival. *Resuscitation* 2009; **80**:407-11. [19167148] [doi:10.1016/j.resuscitation.2008.12.005]
- Ristagno G, Tang W, Chang YT, Jorgenson DB, Russell JK, Huang L, Wang T, Sun S, Weil MH. The quality of chest compressions during cardiopulmonary resuscitation overrides importance of timing of defibrillation. *Chest* 2007; **132**:70-5. [17550931] [doi:10.1378/chest.06-3065]
- Sandroni C, Ferro G, Santangelo S, Tortora F, Mistura L, Cavallaro F, Caricato A, Antonelli M. In-hospital cardiac arrest: survival depends mainly on the effectiveness of the emergency response. *Resuscitation* 2004; **62**:291-7. [15325448] [doi:10.1016/j.resuscitation.2004.03.020]
- Skrifvars MB, Rosenberg PH, Finne P, Halonen S, Hautamäki R, Kuosa R, Niemelä H, Castrén M. Evaluation of the in-hospital Utstein template in cardiopulmonary resuscitation in secondary hospitals. *Resuscitation* 2003; **56**:275-82. [12628558] [doi:10.1016/S0300-9572(02)00373-8]
- Di Bari M, Chiarlone M, Fumagalli S, Boncinelli L, Tarantini F, Ungar A, Marini M, Masotti G, Marchionni N. Cardiopulmonary resuscitation of older, in-hospital patients: immediate efficacy and long-term outcome. *Crit Care Med* 2000; **28**:2320-5. [10921559] [doi:10.1097/00003246-200007000-00023]
- Cooper S, Janghorbani M, Cooper G. A decade of in-hospital resuscitation: outcomes and prediction of survival? *Resuscitation* 2006; **68**:231-7. [16325314] [doi:10.1016/j.resuscitation.2005.06.012]
- de Vos R, Koster RW, De Haan RJ, Oosting H, van der Wouw PA, Lampe-Schoenmaeckers AJ. In-hospital cardiopulmonary resuscitation: prearrest morbidity and outcome. *Arch Intern Med* 1999; **159**:845-50. [10219930] [doi:10.1001/archinte.159.8.845]
- Ballew KA, Philbrick JT, Caven DE, Schorling JB. Predictors of survival following in-hospital cardiopulmonary resuscitation. A moving target. *Arch Intern Med* 1994; **154**:2426-32. [7979838] [doi:10.1001/archinte.154.21.2426]
- Ebell MH. Prearrest predictors of survival following in-hospital cardiopul-

- monary resuscitation: a meta-analysis. *J Fam Pract* 1992;**34**:551-8. [1533659]
- 17 Herlitz J, Bång A, Alsen B, Aune S. Characteristics and outcome among patients suffering from in hospital cardiac arrest in relation to whether the arrest took place during office hours. *Resuscitation* 2002;**53**:127-33. [12009216] [doi:10.1016/S0300-9572(02)00014-X]
- 18 Dumot JA, Burval DJ, Sprung J, Waters JH, Mraovic B, Karafa MT, Mascha EJ, Bourke DL. Outcome of adult cardiopulmonary resuscitations at a tertiary referral center including results of "limited" resuscitations. *Arch Intern Med* 2001;**161**:1751-8. [11485508] [doi:10.1001/archinte.161.14.1751]
- 19 Cooper S, Cade J. Predicting survival, in-hospital cardiac arrests: resuscitation survival variables and training effectiveness. *Resuscitation* 1997;**35**:17-22. [9259055] [doi:10.1016/S0300-9572(97)00020-8]
- 20 Bolandparvaz S, Mirzaee M, Abbasi H, Amin A. CPR results in cardiac arrested patients in Nemazee Hospital, Iran. *Iranian red crescent Med J* 2008;**10**:118-21.
- 21 Berimnezhad L, Berimnezhad V, Rasooli M, Samiei S. The prevalence of factors influencing cardiopulmonary resuscitation outcome in Imam Khomeini hospital affiliated to Tehran University of Medical Sciences 2003. *Rafsanjan Univ Med Sci J* 2005;**4**:228-35. [Persian]
- 22 Hajbaghery MA, Mousavi G, Akbari H. Factors influencing survival after in-hospital cardiopulmonary resuscitation. *Resuscitation* 2005;**66**:317-21. [16081201] [doi:10.1016/j.resuscitation.2005.04.004]
- 23 Hajbaghery MA, Akbari H, Mousavi GA. Survival after in-hospital cardiopulmonary resuscitation. *Res Med Sci J* 2005;**10**:156-63.
- 24 Jafariyan A. Rate of successful cardiopulmonary resuscitation in "Haft Tir" hospital, Tehran. *Iran Univ Med Sci J* 2002;**30**:327-31. [Persian]
- 25 Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME, Berg RA, Nichol G, Lane-Trullt T. Cardiopulmonary resuscitation of adults in the hospital: A report of 14720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation. *Resuscitation* 2003;**58**:297-308. [12969608] [doi:10.1016/S0300-9572(03)00215-6]
- 26 Granja C, Cabral G, Vieira A. Outcome of cardiac arrests in a Portuguese hospital--evaluation of a hospital cardiopulmonary resuscitation program at one year. *Rev Port Cardiol* 2001;**20**:943-56. [11770444]
- 27 Tibballs J, Kinney S. A prospective study of outcome of in-patient paediatric cardiopulmonary arrest. *Resuscitation* 2006;**71**(3):310-8. [17069956] [doi:10.1016/j.resuscitation.2006.05.009]
- 28 Suraseranivongse S, Chawaruechai T, Saengsung P, Komoltri C. Outcome of cardiopulmonary resuscitation in a 2300-bed hospital in a developing country. *Resuscitation* 2006;**71**:188-93. [16987585] [doi:10.1016/j.resuscitation.2006.04.004]
- 29 Enohumah KO, Hinz J, Bahr J, Neumann P, Quintel M. Outcome of cardiopulmonary resuscitation in the intensive care units of a university hospital. *Afr J Reprod Health* 2006;**10**:104-15. [16999200]
- 30 Reinhard V, Pärna K, Lang K, Pisarev H, Sipria A, Starkopf J. Long-term outcome of bystander-witnessed out-of-hospital cardiac arrest in Estonia from 1999 to 2002. *Resuscitation* 2009;**80**:73-8. [19103397] [doi:10.1016/j.resuscitation.2008.08.012]