

CPCR results in cardiac arrested patients in Nemazee Hospital, Iran

Sh Bolandparvaz*¹, M Mirzaee¹, HR Abbasi¹, A Amini²

¹Trauma Research Center, Department of Surgery, ²Department of Anesthesia, Shiraz University of Medical Sciences, Shiraz, Iran

Abstract

Background: During recent years, in-hospital cardiopulmonary resuscitation (CPR), management has received much attention. However, the rate of survival after in-hospital resuscitation in Nemazee Hospital is not known. Therefore, this study was designed to evaluate the outcome of in-hospital cardiopulmonary resuscitation (CPR) in Shiraz, Iran.

Methods: A cross-sectional study was conducted on all cases of in-hospital cardiopulmonary resuscitation. Age and sex of patients, shift, time from the onset of cardiac arrest to the initiation of CPR, and also defibrillation, duration and result of CPR were recorded in a checklist.

Results: 459 cases of CPR (62.3% males and 37.7% females) were enrolled. The survival rate was similar for both sexes. 1st hr survival was observed in 10.6% of cases and only 0.4% survived to discharge. The key predictors of survival to hospital discharge were CPR duration, time from the onset of cardiac arrest to the initiation of CPR, and defibrillation within the first few minutes of cardiac arrest.

Conclusions: More attention must be paid to cardiopulmonary resuscitation managements to promote the survival after cardiopulmonary resuscitation and provide accurate data on our performance with regards to the chain of survival.

Keywords: Cardiopulmonary resuscitation (CPR); Survival rate; Southern Iran

Introduction

Cardiopulmonary arrest could be saved by immediate cardiopulmonary resuscitation (CPR).¹ Average survival to discharge has been about 15%, with some claims of improved survival over the last decade.² It is well recognized that improved outcomes from cardiac arrest are dependant on three key factors of early institution of effective CPR, optimizing response times and early defibrillation.³ The chance of success for CPR increases when it is delivered within the first 4 min of arrest and defibrillation within 8 min. Some authors have reported that the survival rate following out of hospital resuscitation has improved by 30-40%

by decreasing response time, early CPR, widespread CPR training, a short distance to the site of arrest, and skill of ACLS teams.⁴ Herlitz found that patients with in-hospital cardiac arrest had a survival rate more than four times higher than the out-of-hospital group.⁵ However, some other studies reported that the survival rate after in-hospital CPR was low.⁶ In an effort to explain this low rate of success of in-hospital resuscitation, many authors examined the relation between pre-arrest variables and survival following in-hospital CPR.⁷⁻⁹ These studies reported that the hospitalized patients may have a poor prognosis because of critical circulatory, respiratory, neurological, and malignant disorders. Age, hypotension, azotemia, pneumonia and homebound life style were also shown to be independent predictors of mortality after in-hospital CPR.¹⁰ Others attributed the low survival rate after in-hospital CPR to the factors such as poor knowledge and skill of health care providers, and

*Correspondence: Shahram Bolandparvaz, MD, Assistant Professor of Department of Surgery, Shiraz University of Medical Sciences, Shiraz, Iran. Tel: +98-711-6306093, Fax: +98-711-2345080, e-mail: shboland@sums.ac.ir
Received: October 17, 2007 Accepted: March 9, 2008

their lack of formal life support training.^{4,11} Considering the discrepancies between the reported studies, a variety of influencing factors and lack of information about the success rate of in-hospital CPR in Iran, this study was conducted to determine some peri-arrest variables and survival following in-hospital CPR in hospitals in Shiraz, Iran.

Materials and Methods

A cross-sectional study was conducted on all patients who received CPR in 2006 in Nemazee Hospital affiliated to Shiraz University of Medical Sciences in Shiraz, Iran. It is a referral center for one-quarter of the Iran's medical cases with about 25000 admissions per year (with 540 beds) with average bed occupancy of 79%. Any patient who received in-hospital CPR was included. A checklist was prepared for recording the data in each case. The checklist was made up of some questions including type of ward, age, sex, working shift, number of rescuers, the underlying cause of cardiac arrest, time from the onset of cardiac arrest to CPR initiation (response time) and to the first defibrillation, the outcome and duration of CPR, the presence or absence of defibrillator at the time of arrest, the time lost preparing the defibrillator (if not already available in the ward) and the patient's need for ventilator. The researcher, a general practitioner or medical student was responsible for inspecting different wards every day, completing the checklist and proceeding the patients during a week and a month later. Finally, the outcome of resuscitation was recorded as unsuccessful (death of patient), short term survival and survival to hospital discharge. Each patient was

considered only once. For patients who suffered multiple cardiac arrests, only the initial in-hospital CPR was recorded. Statistical analysis was performed using SPSS software, version 11.5. The X^2 test was used to evaluate the effects of the time of the initiation of CPR, working shift, etiology (cardiac or non cardiac) and gender on survival. The ANOVA test was also used to evaluate the effects of the period before initiation of CPR, and the time between the onset of cardiac arrest and the first defibrillation on survival. Also, the effect of working shift on the time served for initiation of CPR was evaluated. The Ethics Committee of Shiraz University of Medical Sciences approved the study.

Results

459 cases of CPR were investigated during the research period. The study population consisted of 286 males (62.3%) and 172 females (37.7%) ranging from >1 to 80< years. Figure 1 shows the frequency of patients in different ages during research period. The rates of success were similar for both sexes. From the total of CPR cases, 89.4% (412 cases) were unsuccessful (death) at the first hour, 5.4% (25 cases) resulted in death between 1 to 6 hours, 3.3% (15 cases) expired within 6 to 24 hours, 1.3% (6 cases) expired after one week and only 0.4% (2 cases) survived after one month. Regarding the practice of CPR, for 1.08% (5 cases), 2 emergency medical staff participated, for 26.36% (121 cases), 3 emergency medical staff, for CPR of 45.53% (209 cases), 4 emergency medical staff, for 18.30% (84 cases), 5 emergency medical staff and for 8.71 (40 cases), more than 5 participated.

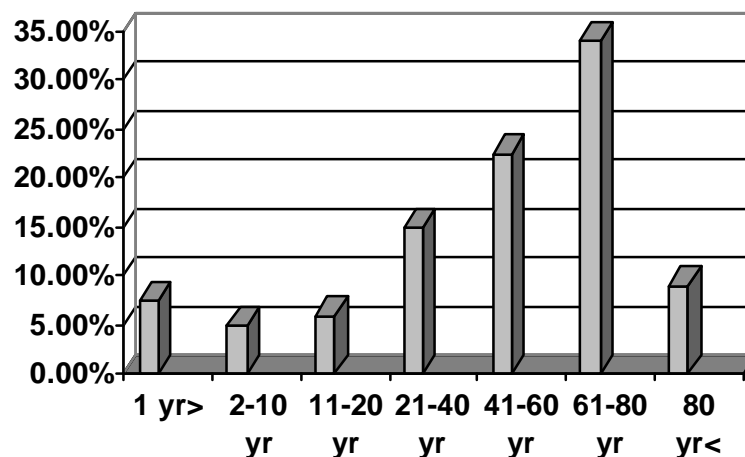


Fig 1: Frequency of patients in different ages during research period.

CPR started 1-9 min after the onset of cardiac arrest in all cases. 97.5% of cases with short-term survival had a response time of 1-6 min. A defibrillator was available at the initiation of CPR in 260 cases (56.6%). However, it took 10.5 ± 6.5 min to transfer and prepare the apparatus, when it was not already present. The mean interval time from the initiation of CPR to the application of the first DC shock was 10.4 ± 7.8 min. However, in 25% of cases the first shock was delivered in the first 1-6 min and in 53%, it was delayed for more than 10 min. DC shocks were used mostly in the critical care and emergency units. The mean interval time from the initiation of CPR to the application of first shock was 7.9 ± 4.5 min in critical care units and 16.5 ± 11.2 min in general wards. 72.1% of the resuscitation attempts lasted for less than 30 min and 27.5% for 31-60 min. The mean CPR duration was 19.5 ± 15.9 min for patients who survived for a short time and 10.5 ± 4.1 min for patients who survived to hospital discharge. The rate of survival decreased when the duration exceeded 13 min. No patients survived to discharge with CPR lasting more than 30 min.

Discussion

A small number of patients survived after the onset of cardiac arrest. The overall rate of survival leading to hospital discharge was 0.4% for in-hospital CPR. Our findings contrast with the results from some authors reporting long-term survival rates of 13.4 to 32.2%.¹²⁻¹⁵ This wide difference could be attributed to the different definitions of long and short-term survival and also the types of patients and also it is possible that despite the effort to keep the CPR records accurate, records of many successful CPR attempts were not kept properly, leading to decrease in percentage of successful attempts dramatically. Survival to hospital discharge was not associated significantly with either patient age ($P=0.124$) or with the etiology of cardiac arrest ($P=0.22$). These findings are in accordance with the observations of Brindley et al.¹⁶ There was no significant relationship between the outcome of CPR and working shifts. There was a relationship between the survival in the first hour and the response time ($P=0.041$). Long-term survival and survival to hospital discharge were not associated with the location of cardiac arrest and working shift. This contrasts with some studies that reported a better outcome in morning shifts due to shorter response time.¹⁶⁻¹⁸ Several studies have also shown that CPR performed during the day results

in more survivors than at other times.^{19,20} It seems that factors such as early detection of cardiac arrest due to the presence of medical and nursing staff at the patient's side and quick access to physicians and skilled staff may have caused this difference. Studies showed that improved survival depends on early detection of cardiac arrest and prompt basic life support as demonstrated. According to studies, early defibrillation plays an important role in reducing cardiac arrest deaths, also in our data early defibrillation increased short-term survival.^{21,22} In the present study, most patients resuscitated successfully (in short-term) were defibrillated within the first 4 min of cardiac arrest. Studies have been shown that a short interval from collapse to delivery of the first shock is associated with better neurological outcome and survival. The chance of successful recovery decreases 5-10% for each minute delay in defibrillation. Rarely did a patient survive if the delay exceeded 8 min. Therefore, delay in defibrillation is seen as one of the most important measures affecting survival after cardiac arrest. However, the present study showed that in 53% of cases the shocks was delayed for more than 10 min. It seems that the first valuable minutes were usually wasted transferring and preparing the defibrillation for the general wards. In our hospitals, defibrillators are located in critical care units (i.e., ICU, CCU, emergency departments and operating rooms). General wards usually have defibrillators but their staffs are mostly not skilled in using them and not trained to defibrillate patients with cardiac arrest. By locating the defibrillators in strategic areas of the hospital, training general ward nurses, and giving them the authority to use defibrillator, it might be possible to reduce the time from cardiac arrest to defibrillation. The delay for defibrillation was also notable in critical care units where the defibrillator should always be present. It appears that the first minutes usually are lost for measures such as tracheal tube insertion and insufficient skill. Tube insertion also presents difficulties. Late initiation of CPR and the time lost for intubations usually cause a delay of more than 6 min and the golden opportunity is lost. This problem may be related to the ABC method of education for CPR. While new research shows that the oxygen available in blood stream is sufficient for the brain even for 10-15 min after the cardiopulmonary arrest, no patients survived to discharge with CPR lasting more than 30 min. This finding is confirmed by Tok et al.¹⁸ who reported that patients resuscitated within 15 min have a better outcome, whereas those resuscitated after 30 min usually die in the ICU. The duration of CPR is considered to

reflect the severity of disease, the time between the onset of arrest and the initiation of CPR, and the effectiveness of CPR. Some authors have reported that the cerebral blood flow decreases progressively as CPR continues and therefore the chance of survival decreases. The results of this study demonstrate a very low survival rate in comparison with other studies, especially in the USA and Europe.¹³⁻¹⁵ This study supports previous findings that in order to increase the survival of in-hospital CPR, the response time should be shortened and the facilities for early defibrillation increased. So, the need for improvements in CPR management strategies, equipping hospital wards with better facilities for CPR, especially defibrillator, basic and advanced life support training programs and post

resuscitation care are critical. Post resuscitation cares have an important role in increasing long term survival. However, our results could not necessarily be generalized to all hospitals in Iran. Additional research will provide a pool of accumulated data pertinent to factors affecting survival after in-hospital CPR and would help to provide better management of in-hospital CPR.

Acknowledgement

The authors would like to thank Dr. D. Mehrabani at Center for Development of Clinical Studies of Nemaee Hospital for editorial assistance.

References

- Hsieh M, Dailey MW, Callaway CW. Surrogate consent by family members for out-of-hospital cardiac arrest research. *Acad Emerg Med* 2001;**8**:851-853.
- Simon C, Mohsen J, Glenda C. A decade of in-hospital resuscitation: outcomes and prediction of survival? *Resuscitation* 2006;**68**:231-237.
- Lemaire F, Bion J, Blanco J, Damas P, Druml C, Falke K, Kesecioglu J, Larson A, Mancebo J, Matamis D, Pesenti A, Pimentel J, Ranieri M. The European Union Directive on Clinical Research: present status of implementation in EU member states' legislations with regard to the incompetent patient. *Intensive Care Med* 2005;**31**:476-479.
- Caffrey SL, Willoughby PJ, Pepe PE, Becker LB. Public use of automated external defibrillators. *N Engl J Med* 2002;**374**:1242-1247.
- Herlitz J, Ekstrom L, Wennerblom B, Axelsson A, Bang A, Holmberg S. Effect of bystander initiated cardiopulmonary resuscitation on ventricular fibrillation and survival after witnessed cardiac arrest outside hospital. *Br Heart J* 1994;**72**:408-412.
- Nichol G, Detsky AS, Stiell IG, O'Rourke K, Wells G, Laupacis A. Effectiveness of emergency medical services for victims of out-of-hospital cardiac arrest: a metaanalysis. *Ann Emerg Med* 1996;**27**:700-710.
- Wik L, Kramer-Johansen J, Myklebust H, Sorebo H, Svensson I, Fellows B, Steen PA. Quality of cardiopulmonary resuscitation during out-of-hospital cardiac arrest. *JAMA* 2005;**293**:299-304.
- Abella BS, Alvarado JP, Myklebust H, Eldelson DP, Barry A, O'Hearn N, Vanden Hoek TL, Becker LB. Quality of cardiopulmonary resuscitation during in-hospital cardiac arrest. *JAMA* 2005;**293**:305-310.
- Chamberlain DA, Hazinski MF. Education in resuscitation: an ILCOR symposium: Utstein Abbey: Stavanger, Norway: June 22-24, 2001. *Circulation* 2003;**108**:2575-2594.
- Kern KB, Hilwig RW, Berg RA, Sanders AB, Ewy GA. Importance of continuous chest compressions during cardiopulmonary resuscitation: improved outcome during a simulated single lay-rescuer scenario. *Circulation* 2002;**105**:645-649.
- American Heart Association in collaboration with International Liaison Committee on Resuscitation. Guidelines 2000 for cardiopulmonary Resuscitation and emergency cardiovascular care: International Consensus on Science, part 3: Adult basic life support. *Circulation* 2000;**102(suppl)**:122-159.
- American Heart Association in collaboration with International Liaison Committee on Resuscitation. Guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care: International Consensus on Science, part 5: New Guidelines for First Aid. *Circulation* 2000;**102(suppl 1)**:I-77-I-85.
- Miranda DR. Quality of life after cardiopulmonary resuscitation. *Chest* 1994;**106**:524-30.
- Fifield DH. Outcomes of resuscitation efforts at Wild Rose Hospital. *Wisconsin Med J* 1994;**93**:55-7.
- Robinson GR, Hess D. Post discharge survival and functional status following in-hospital cardiopulmonary resuscitation. *Chest* 1994;**105**:991-6.
- Brindley PG, Markland DM, Mayers I, Kutsogiannis DJ. Predictors of survival following in-hospital adult cardiopulmonary resuscitation. *Can Med Assoc J* 2002;**167(4)**:343-8.
- 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 hospitals: A report of 14720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation. *Resuscitation* 2003;**58(3)**:297-308.
- Tok D, Keles GT, Toprak V, Topcu I. Assessment of in-hospital cardiopulmonary resuscitation using utstein template in a university hospital. *Tohoku J Exp Med* 2004;**202**:265-73.
- Hershey CO, Fisher L. Why outcome of cardiopulmonary resuscitation in general wards is poor. *Lancet* 1982;**1(8262)**:31-4.
- Scott RP. Cardiopulmonary resuscitation in a teaching hospital: a survey of cardiac arrests occurring outside intensive care units and emergency rooms. *Anaesthesia* 1981;**36(5)**:526-30.
- Jennings P, Pasco J. Survival from out-of-hospital cardiac arrest in the Geelong region of Victoria, Australia. *Emerg Med* 2001;**13(3)**:319-25.
- Holmberg M, Holmberg S, Herlitz J, Gardelov B. Survival after cardiac arrest outside hospital in Sweden. Swedish cardiac arrest registry. *Resuscitation* 1998;**36(1)**:29-36.