

Improving the outcomes of CPR: A report of a reform in the organization of emergency response

L Borimnejad, A Nikbakht Nasrabadi, H Mohammadi, L Kheirati

Citation

L Borimnejad, A Nikbakht Nasrabadi, H Mohammadi, L Kheirati. *Improving the outcomes of CPR: A report of a reform in the organization of emergency response*. The Internet Journal of Emergency Medicine. 2007 Volume 4 Number 2.

Abstract

Successful outcome following cardiac arrest have been reported in the range of 13–59%. Several studies have shown that medical centers with trained and designated emergency personal have improved discharge survival. This study designed with aim to determine the value of formal CPR Team in improving the out comes of CPR in a central Medical Center in Iran .

Material and Method:

This quasi-experimental study designed in three stages. 1) Determine outcomes and quality of performance of existence routine CPR team 2) Education, training and programming for CPR team members and 3) evaluation of outcomes of new strategy. The samples were adult inpatients. A checklist used to evaluation the quality of performance of CPR and gaining further related information.

Results:

Among resuscitated patients, with mean age $58/12 \pm 19.6$ there was no significant difference in demographics and physiologic variables in two groups. There was significant difference in initial outcome, between before and after intervention (18.4% versus 30% and mean hours' survival 28 versus 88.44 hours.)

Conclusion:

Trained and designated emergency personal have improved the outcomes of CPR. Hospital managers and nursing associations should consider CPR training and continuing education for all nurses.

INTRODUCTION

The Chain of Life system must involve well-trained first-aid staff, committed medical personnel, essential equipments, a well-established line of communication and efficient organization. Failure of just one of these elements may result in failure of the system to fulfill its life saving function. (1)

During the 40 years after the introduction of modern CPR there have been major developments and changes in the performance of resuscitation.[2] Although some authors have showed improved survival rates [3] others have found them to be relatively constant during this period[4] But only 10-15% of patients who receive CPR following cardiopulmonary arrest will survived to be discharge.[5]

The lack of resuscitation skills of nurses and doctors in basic and advanced life support has been identified as a contributing factor to poor outcomes in post cardiac arrest [6]. A study in great hospital in Iran confirmed these reports

[7] In an effort to improve cardiac arrest outcomes, recent investigations have focused on the timing and quality of CPR. For example, a study of in-hospital resuscitation showed that even short delays in the initiation of CPR correlated with poor outcomes. Another in-hospital investigation demonstrated that Advance Cardiac Life Support training among nurses to be strongly and dramatically associated with a fourfold increase in survival to discharge. The association between ACLS training and survival that maintained after controlling for rhythm severity indicates that ACLS-trained nurses provide an independent contribution to the increased survival rate [8]. The majority of studies carry out in US and Europe considering requirements for ACLS training for health care professionals varies significantly between countries (9). In this study we aimed to improve the uniformity and the level of care, and to provide prompt and correct resuscitation and care for patients. We hypothesized that an organized emergency

resuscitation team, together with proper training of the team, can increase the outcomes of CPR and the confidences of the members in providing resuscitation.

METHODS

The researchers used pretest, post-test design. The study was conducted at the Emergency Department (ED) of the 1000-bed referral academic medical center in Tehran, Iran. At the beginning of the study the estimation of monthly arrest were 30 patients during the past one-year.

The participants in this study had to meet the following eligibility criteria: Age between 18 and 65 years old, in hospital (ED) arrest, without any evidences of malignancy, and multiple traumas or end stage diseases. DNR orders patients and out hospital cardiac arrest patients were excluded from the study. If more than one arrest occurred in an individual during the hospital stay, only the initial incident was recorded.

CPR TEAM CHARACTERISTICS

Since a dedicated resuscitation team were not available in research setting, after call 99 a team led by a chief resident, ward residents and nurses were performed all CPR.

DATA COLLECTION METHODS

The researchers used observational tools to measure the quality of performance in two groups. Two observers were previously certified in basic and advance life support and had prior experiences in cardiac resuscitation with Master Degree in Medical surgical Nursing. They watched the performance of teams and then marked on previous prepared and validated checklist form. Cronbach's alpha coefficient for the simultaneous observation was .87.

In the other CPR forms various data including; the demographics, medical history, CPR duration, time of day, the delay before the onset of CPR, tracheal intubations status, the ECG initial rhythm, the management of CPR, the type and dose of administrated drugs were recorded. In this study successful CPR was defined as the return of spontaneous cardiac output. This was classified as 'immediate survival'. Patients who survived were followed up until death or discharge from hospital. All forms were peer reviewed carefully, and all uncompleted forms were excluded before data analysis.

INTERVENTION

In the first fashion of the study, cardiac arrests were observed and recorded from January 2005 to October 2005.

The observers were two qualified nurses who were resident in the ED. In every event they recorded the whole CPR process continuously from their arrival at the arrest scene throughout of the final stage of the CPR efforts.

In the second phase of study, CPR Committee decided to establish designed CPR team and trained all of the nursing staffs in the ED. They participated in a three-day CPR Workshop and tried update their knowledge and performances base on American Hearth Association Guideline 2005. Instructors were Faculty members and qualified in CPR education. They used manikin and slide presentations in their educational workshop. The participants had enough time and opportunity for more exercises on manikins with facilitators' supervisions.

Finally in the third step, investigators evaluated again the quality of performance and the out come of CPR performed by trained CPR Team From April 2006 to May 2007. They were certified in basic and advanced life support.

DATA ANALYSIS

All data were collected and analyzed using statistical package for social sciences version 11.5 Factors influencing immediate survival were assessed by multivariate analysis of categorical data by using chi-square test. Paired t-tests were undertaken on columns of difference. The t-test results indicated significance at the level of $P = 0.05$.

RESULTS

In the first phase of study (without trained team) one hundred and ten patients who required cardiopulmonary resuscitation, were studied prospectively from January 2005 to October 2005 at the research setting. Eighty-seven of patients had inclusion criteria and included into the study. Following CPR, immediate survival were 16 (18.4%) patients while other patients died. During follow up Mean of survival hours were 28 ± 21 and no any one of patients survived to hospital discharge.

After training and establishing a new organization of CPR team, results showed immediate survival improved significantly. Initial outcomes were (30%) successfully. The mean of survival hours was 88.4 ± 36.1 There were differences between initial outcomes in two groups ($P < 0.01$) however demographic and physiologic characteristics of the patients did not differ significantly but hospital discharge remained zero. Immediate survival associated with the initial rhythm, duration of CPR but sex, age and etiology did not influence the immediate survival rates significantly. Table

(1)

Association between immediate survival and characteristics of CPR teams; are compared in table 2. Immediate survival rate was 10 (64.3%) for patients in which CPR was commenced in less than 2 minutes. In contrast, survival rate was zero when CPR was started after 5 minutes ($P = 0.001$). In patients who survived, mean time to resuscitation was 28.7 ± 9.09 min. The duration of arrest had significant effects on the early outcome; patients. ($p=0.005$)

According to the initial rhythm during cardiac arrest, patients with asystole had higher immediate dead rates ($P = 0.003$) than patients with Ventricular tachycardia or ventricular fibrillation (75.7% vs 33.3 patients).

Figure 1

Table 1: baseline patient and cardiac arrest event characteristics

	With formal team (N=53)	Without formal team (N=87)	P value
Patient characteristic			
Age			
Sex male	59.43 \pm 19.16 36 (67.9%)	58.12 \pm 19.16 44 (50.7%)	0.646 0.435
Cardiac arrest characteristic			
Initial rhythm			
VF	1(1.9%)	7(8.5%)	
VT	8(15.4%)	5(7.4%)	0.13
PEA	10 (19.2)	22(28%)	
Asystol	33(63.5%)	44(53.7)	
CPR Stared	0.95 \pm 1.86	1.67 \pm 1.54	0.08
Air way achieved delayed	13 (25.5%)	31 (37.3%)	0.06
Delayed Defibrillator	22(40.4%)	45 (54.9%)	0.07
Compression respiration ratio			
5/1	30 (57.7%)	62 (74.4%)	
15/2	23 (42.3%)	5 (6%)	0.001
Inappropriate	-	16(19.6%)	
Delayed Defibrillator	22(40.4%)	45 (54.9%)	0.07

Figure 2

Table 2: comparisons between immediate survival and duration of CPR in two groups

Formal team		Time to ROSC or terminated mean \pm SD	P=0.03
With	Live	28.7 \pm 9.09	
	Dead	37.9 \pm 9.81	
Without		19.68 \pm 7.6	
	Dead	26.78 \pm 11.33	

DISCUSSION

In this study, we found formal, structured emergency resuscitation team to be strongly associated with increased of survival in arrested patients. furthermore, we found no any significant association between patient's related variables (gender, age,) and nurse's related variables (age, work-years,) with the rate of survival in patients. In this case by assigning duties to a small group of emergency physicians and nursing staff, each member of the resuscitation team understands the role he/she plays. While before of our study there was no formal resuscitation team, patients were resuscitated by the emergency physicians and nurses at the ED. Sometimes senior emergency physicians and nurses on duty could not arrive at the resuscitation area immediately because they were occupied with other duties. We created a modified emergency resuscitation team, which was based on the previous existing emergency resuscitation team [12,13] Henderson and Ballesteros found that a focused resuscitation team with well-trained and well-practiced individuals provided a more reliable response.

Results from various studies varied from country to country as well as from regions of the same country. Previous data are supported by the present study in which the quantity and experience of CPR team member has been found as the strongest independent predictors of discharge survival._(1,2,10,11)

In our hospital the nurses are not allowed to defibrillate and they perform only basic life support. Thus, defibrillation and advanced life support depend on the arrival of the cardiac arrest team. However only initiation of CPR before 5 min arrest was found to be a significant predictor of discharge survival. Instead of increasing the team members and planning to have a specific task group as well as sufficient equipments, a systematic training of the ward personnel and

nurses would be a better approach.

Unfortunately, in Iran standard resuscitation teaching and training is not yet included in the curricula of nurse schools and continuing postgraduate education on that subject is not mandatory. A better standardization of undergraduate education, and postgraduate education for all hospital staff members with patient contact, provided by specifically designated healthcare professionals, should be recommended. National guidelines for resuscitation practice and training in the hospitals could provide a reference to identify the minimum competence, staff and equipment required to maintain standards of care. Since the prognosis of in-hospital cardiac arrest is still poor, early recognition of patient at risk by the ward staff is extremely important to prevent further deterioration to cardiac arrest.

Successful resuscitation requires early recognition of cardiopulmonary arrest, rapid activation of trained responders, timely CPR, defibrillation when indicated, and early use of ACLS [21]. In the present study, age, sex and etiology of the arrests did not influence immediate survival rate. The majority of studies confirm these results. [4,12,14,19]

In current study, we found nursing staff trained team played a vital role in the outcome of CPR. The team leader should be authoritative and most of the team leaders were senior emergency residents who were well-trained ACLS providers, however the rate of return of spontaneous circulation ROSC varied on whether the team was well instructed or not. Pre-assigned roles for every resuscitation member allow staff to respond more rapidly and correctly. Periodic discussion and assessment heighten team spirit and reduce the chance of future mistakes [25]. As a result, our study is not final proof that the quality of CPR is of ultimate importance for the outcome among patients suffering from cardiac arrest. This finding is in agreement with many previous reports [1, 20, 21, 26].

CONCLUSION

The establishment of a formal and structured emergency resuscitation team in the ED is associated with an increased rate of survival in patients especially those admitted in General public hospitals.

Our data also revealed that early initiation of CPR with an experienced team in general hospital sites increased the discharge survival rate following resuscitation. Therefore, we emphasize that all medical staff should have CPR training with periodic renewal and essential equipment

should be readily available at all sites.

LIMITATIONS OF THE STUDY

Some limitations of this study should be acknowledged. First, because this study was conducted at a single large institution, external validity is relative and uncertain. A multicenter investigation is required to achieve more validity.

ACKNOWLEDGE

The authors' wishes to express his gratitude to Dr Majdzadeh and research Vice chancellor of Tehran University of medical sciences for financial support of this study and thanks with all help us.

There is no any conflict interest

References

1. Moretti MA, Machado LA, Nusbachera CA, Kern KB, Timmerman S, Franchini J. Advanced cardiac life support training improves long-term survival from in-hospital cardiac arrest. *Resuscitation* 2007; 72, 458-465.
2. Pembeci K, Yildirim A, Turan E, Buget M, Camci E, Senturk M et al. Assessment of the success of cardiopulmonary resuscitation attempts performed in a ACTA Anaesthesiologica Turkish university hospital. *Resuscitation* 2006;68(2):221-229.
3. Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME, et al. 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.
4. Shultz SC, Cullinane DC, Pasquale MD, Magnant C, Evans SR. Predicting in-hospital mortality during cardiopulmonary resuscitation. *Resuscitation* 1996; 33(1):13-7.
5. Rubertson. Cardiopulmonary cerebral resuscitation present and future perspectives. *Anaesthesiol Scand* 1999; 43: 526-535.
6. Ransie J. Cardiac arrest: can the in hospital chain of survival be improved? *Australasian Emergency Nursing Journal* 2006; 9, 23-27.
7. Borimnejad L, Rasouli M, Borimnejad V, Samiee S. Frequency of Some of factors Affecting Adults Cardio Pulmonary Resuscitation Outcome in Emam Khomeini Hospital Rafsanjan University of medical Sciences. *2004;4(4):24-29*.
8. Ballew K. Cardiopulmonary resuscitation: Recent advances. *Br Med J* 1997; 314:1462-6.
9. Hamilton R. Nurses' knowledge and skill retention following cardiopulmonary resuscitation training: a review of the literature. *Journal of Advanced Nursing* 2005; 51(3), 288-297.
10. Boyd J. A review of nurses' performance of cardiopulmonary resuscitation at cardiac arrest. *Journal of Nursing Staff Development* 2001;17(5), 248-255.
11. Chamberlin-hazinski. Education in resuscitation, *Resuscitation* 2003; 59(1) 11-43.
12. Hollis S. & Gillespie N. An audit of basic life support skills amongst general practitioner principles: is there a need for regular training? *Resuscitation*, 2000; 44(3), 171-175.
13. Rozenbaum EA and. Shinkman L, Predicting outcome

in in hospital cardiopulmonary resuscitation. Critical Care Medicine 1998; 16, 583-586.

14. Dane, K.S. Russel-Lindgren, D.C. Parish, M.D. Durham and T.D. Brown, In-hospital resuscitation: association between ACLS training and survival to discharge, Resuscitation 2000; 47 : 83-87.

15. Vadeboncoeur T, et al., The Save Hearts in Arizona Registry and Education (SHARE) program: Who is performing CPR and where are they doing it?, Resuscitation 2007 .02.015

16. Henderson SO and Ballesteros D, Evaluation of a hospital-wide resuscitation team: does it increase survival for in-hospital cardiopulmonary arrest? Resuscitation 2001; 48;2:111-116

17. Buist MD, Moore GE, Bernard SA, Waxman BP, Anderson JN, Nguyen TV. Effects of a medical emergency team on reduction of incidence and mortality from unexpected cardiac arrest in hospital: preliminary study. Br Med J 2002;324:387-90

18. Sanders AB, Kern KB, Atlas M, Bragg S, Ewy GA. Importance of the duration of inadequate coronary perfusion pressure on resuscitation from cardiac arrest. J Am Coll Cardiol 1985; 6:113-8.

19. Cooper S, Evans C. Resuscitation Predictor Scoring

Scale for in hospital cardiac arrests. Emerg Med J 2003; 20:6-9.

20. Carlsson J. Gotz J. Miketic s. et al "Acute and long term survival after cardiopulmonary resuscitation" Intensive medicine (1998) 35:34-41

21. Doig C.J. ., Boiteau P.J.E and. Sandham, J.D, A 2-year prospective cohort study of cardiac resuscitation in a major Canadian hospital, Clinical Investigation Medicine 2000: 23 (2), pp. 132-143

22. So H, Buckley TA, Oh TE. (Factors Affecting Outcome Follow Cardiopulmonary Resuscitation" WFSA Available: www.nda.ac.uk/wfsa

23. Suraseranivongse S,, Chawaruechai T, Saengsung P, Komoltri Ch. Outcome of cardiopulmonary resuscitation in a 2300-bed hospital in a developing country Resuscitation (2006) 71, 188-193

24. Ebell MH, Becker LA, Barry HC, Hagen M survival after in hospital cardiopulmonary resuscitation a meta analysis journal on general medicine 1998 13;805-816

25. Weng T, Huang CH, Huei-Ming M, Chang W-T, Liu S, Wang T, Chen W., Improving the rate of return of spontaneous circulation for out-of-hospital cardiac arrests with a formal, structured emergency resuscitation team, Resuscitation 2004 60:137-142].

Author Information

Leili Borimnejad

Assistant professor in Nursing Education, Nursing And Midwifery School, Iran University of Medical Sciences

Alireza Nikbakht Nasrabadi

Associate Professor, Medical –Surgical department, School of Nursing and Midwifery, University of Tehran

hadi Mohammadi

Assistant professor, Azad University Tehran Markaz

Leili Kheirati, BsN

Emergency Nurse, Imam khomeini hospital, University of Tehran