

Original Article

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Correlation of Patients' Baseline Characteristics with Success Rate of Cardiopulmonary Resuscitation; a Cross-Sectional Study

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Abstract

Introduction: Many advances have been made in method, applied medications and the skill of the treatment staff for performing cardiopulmonary resuscitation (CPR), yet the rate of mortality following cardiac arrest is still high, which is affected by many factors.

Objective: This study was designed and performed aiming to evaluate the effective factors in the success rate of CPR.

Method: This cross-sectional study was performed on patients who had undergone CPR in Dr. Shariati Hospital, Isfahan, Iran, from March 2017 to March 2018. A pre-designed checklist was used for data gathering, which included questions regarding demographic data and medical history of the patients, data related to CPR and the final outcome of resuscitation.

Results: A total of 190 patients with the mean age of 69.4 ± 17.7 years were evaluated in the present study, 115 (60.5%) of which were male. Overall, 28.9% of CPRs were initially successful and 5.3% of the cases were finally discharged from the hospital. There was no significant correlation between CPR success and age, sex, hospitalization ward, time interval between hospitalization and cardiac arrest, the number of CPR attempts, or working shift ($p > 0.05$). On the other hand, CPR success significantly correlated with underlying illnesses and the first cardiac rhythm recorded before the initiation of resuscitation ($p < 0.05$).

Conclusion: Based on the findings of the present study, it seems that underlying illness and the initial cardiac rhythm recorded correlate with the probability of CPR success.

Key words: Cardiopulmonary Resuscitation; Cross-Sectional Studies; Outcome Assessment (Health Care); Retrospective Studies

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INTRODUCTION

Every year 400 thousand adult patients are affected with cardiorespiratory arrest in hospitals and cardiopulmonary resuscitation (CPR) usually fails (1). Many hospitals have a CPR team that operates at the time of cardiorespiratory arrest using advanced technology. Yet, the rate of patient survival and discharge from hospital after cardiorespiratory arrest has remained 14.7% in the United States and 16.7% in England for 30 years (2). From 1960, when Kouwenhoven performed CPR by externally massaging the heart, there have been many advances in method, applied medications and the skill of the treatment staff, but the rate of mortality following cardiac arrest is still high, which is affected by many factors. Problems such as trained and skillful people not being available, delay in initiation of the procedure, and massaging techniques have always been a matter of debate and very important (3). The probability of

success in CPR depends on many factors. The probability of success depends on the first rhythm recorded from the patient, duration of resuscitation, time interval between collapse and the initiation of CPR, and the time interval between collapse and the first electric shock (4, 5). Considering the importance of the subject and the undesirable effects of CPR failure, the present study was designed and performed with the aim of assessing the effective factors in CPR success.

METHODS

Study design

The present cross-sectional study was carried out during 2018 in Dr. Shariati Hospital, Isfahan, Iran. The hospital has about 128 thousand visitors annually, out of which an average number of 35 thousand are hospitalized. The protocol of the study was approved by the ethics committee of

Islamic Azad University of Medical Sciences (Ethics code: 15010101952036). Performing the present study did not inflict any additional fees on the healthcare system. To keep patient data confidential, all cases were used without mentioning the name or family name of the patients and data were used solely for research purposes.

Study population

The study population consisted of patients who had undergone CPR in the studied hospital from March 2017 to March 2018. Out-of-hospital cardiorespiratory arrest cases that did not show vital signs upon presentation to the emergency department (ED) and patients with missing data in their hospital profile were excluded. Required sample size for the study was estimated as 139 cases using the sample size calculation formula for prevalence studies and considering 95% confidence interval, 0.1 prevalence of final success in CPR, and accepting 0.05 error; for more confidence, 190 cases were included in the study. Sampling was done using retrospective method.

Data gathering

The tool used in the present study was a checklist consisting of patients' demographic data (including sex, age, chronic underlying illnesses, and the ward in which the patient was hospitalized) and other information related to CPR (the working shift in which cardiac arrest had occurred, the first cardiac rhythm recorded for the patient in the CPR sheet, duration of CPR, the number of resuscitation attempts, measures taken during resuscitation, time interval between hospitalization and cardiac arrest, initial success of CPR and the final outcome of CPR). It should be noted that in the present study, underlying illnesses in patients undergoing CPR were divided into 7 groups of: cardiovascular diseases, internal diseases, cerebrovascular diseases, cancers, accident and trauma, intoxication and other. Internal diseases included infections, diabetes, gastrointestinal bleeding and diseases, and respiratory, liver, and kidney failure.

Statistical analysis

Data resulting from the present study were statistically analyzed using SPSS software version 23. Qualitative results were reported as absolute and relative frequency and quantitative results were presented as mean \pm standard deviation. In analysis of the results, Chi square, Independent T test, and Pearson correlation coefficient were used. Level of significance was considered $p < 0.05$.

RESULTS

From March 2017 to March 2018, 34552 patients

had been hospitalized in the studied hospital and a total of 521 CPRs were performed on 343 patients. 190 patients with the mean age of 69.4 ± 17.7 years were evaluated in the present study, 115 (60.5%) of which were male. Baseline characteristics of these patients are shown in table 1. 79.5% of the patients were over 60 years old. The most common underlying illness in these patients was internal diseases and 97 (51.1%) patients were affected with them. Cardiorespiratory arrest had occurred in a night shift in 84 (44.2%) cases.

Distribution of CPR characteristic frequencies is introduced in table 2. Mean time interval between hospitalization and cardiac arrest in patients was 161.25 ± 129.42 hours, while cardiorespiratory arrest had occurred in less than 24 hours in 47 (24.7%) patients. The first cardiac rhythm recorded in the patients' CPR sheet was asystole in 121 (63.7%) patients. For 125 (65.8%) patients, CPR was performed once and for 65 (34.2%) it was performed more than once. For all the studied patients, drug injection, cardiac massaging and endotracheal tube insertion was done during CPR; 25 (13.2%) patients had also received DC shock during CPR.

Mean duration of CPR in the 190 studied patients was 24.6 ± 13.2 minutes. Minimum and maximum durations of CPR were 3 and 80 minutes, respectively. Out of the 190 studied patients, CPR was reported as successful in 55 (28.9%) of the

Table 1: Demographic data and baseline characteristics of the studied patients

Variable	Frequency (%)
Sex	
Male	115 (60.5)
Female	75 (39.5)
Age (year)	
< 30	8 (4.2)
30-60	31 (16.3)
> 60	151 (79.5)
Hospitalization ward	
CCU / ICU	60 (31.6)
Emergency	60 (31.6)
Others	70 (36.8)
Underlying illness	
Cardiovascular	31 (16.3)
Internal	97 (51.1)
Cancer	20 (10.5)
Cerebrovascular	15 (7.9)
Trauma	8 (4.2)
Intoxication	3 (1.6)
Others	16 (8.4)
Working shift	
Morning	70 (36.8)
Evening	36 (18.9)
Night	84 (44.2)

Table 2: Distribution of cardiopulmonary resuscitation (CPR) characteristic frequencies

Group	Frequency (%)
Time interval between hospitalization and arrest	
< 24 hours	47 (24.7)
1-7 days	94 (49.5)
> 7 days	49 (25.8)
The first rhythm recorded in CPR	
Asystole	121 (63.7)
Pulseless electrical activity (PEA)	59 (31.1)
Ventricular fibrillation (VF)/ Ventricular tachycardia (VT)	10 (5.3)
CPR attempts	
1	125 (65.8)
2	48 (25.3)
3	16 (8.4)
4	1 (0.5)
Measures taken during CPR	
Cardiac massage	190 (100.0)
Medication	190 (100.0)
Endotracheal tube (ETT) placement	190 (100.0)
DC Shock	25 (13.2)
Initial success of CPR	
Successful	55 (28.9)
Unsuccessful	135 (71.1)
Final outcome of CPR	
Discharge from hospital	10 (5.3)
Death	180 (94.7)

patients (initial success) and as unsuccessful in 135 (71.1%) patients (initial failure). Finally, out of the 190 studied patients, only 10 (5.3%) patients had been discharged from the hospital and the other 180 (94.7%) had died.

There was no significant correlation between the initial success of CPR and age ($p = 0.969$), sex ($p = 0.062$), hospitalization ward ($p = 0.403$), time interval between hospitalization and occurrence of cardiorespiratory arrest ($p = 0.843$), working shift ($p = 0.299$), or the number of CPR attempts ($p = 0.718$). On the other hand, it significantly correlated with underlying illnesses ($p = 0.03$), the first cardiac rhythm recorded ($p = 0.001$) and duration of CPR ($p = 0.000$).

DISCUSSION

Demographic data of the patients evaluated in the present study is in line with similar studies performed both in Iran and in other countries. Most of the studied patients were male, which is in line with the results of the study by Alizadeh et al. (6). The reason for this finding might be found in the higher prevalence of cerebrovascular accidents in men (compared to women). In addition, in this study the highest frequency of undergoing CPR was after the 6th decade of life onwards, among the reasons for which, increase in underlying illnesses and natural physiological changes in the body due to old age could be pointed out. From high

prevalence to low prevalence, underlying illnesses in patients undergoing CPR were internal diseases, cardiovascular diseases, cancers, cerebrovascular causes, accident/trauma and intoxication, respectively. Alizadeh et al. reported the highest prevalence for "cardiovascular diseases", which was in the second place in the present study (6). About half of CPRs were performed in the night shift. Montazar et al. (7) also showed that most CPRs were performed in the night shift. Of course, longer working hours in the night shift can be the reason for this finding.

Based on the results of the present study, 28.9% of the CPRs resulted in initial success and finally, 5.3% of the patients who underwent CPR were discharged from the hospital alive. In studies by Haghghi et al. (8), Alizadeh et al. (6) and Nasiripour et al. (9), initial success rates were reported as 21%, 41.1%, and 32%, respectively. Montazar et al. (7) showed that 20.5% of the patients undergoing CPR were discharged from the hospital, which is not in line with the results of the present study. Hu et al. reported that 33.9% of the patients undergoing CPR had spontaneous blood circulation at least once and only 3.3% had 28-day survival (10). Van Puyvelde et al. reported the final success rate of CPR performance as 2.8% (11). Ishtiaq et al. (12) have reported the rate of discharge from hospital as 11%.

It should be noted that for a more real comparison

and understanding, it would be better if various studies would be homogenized regarding the criticalness of the status of patients undergoing CPR, which was almost impossible. In the CPR guideline of the American Heart Association published in 2010 it has been pointed out that a multidisciplinary care program should be prepared for post-CPR care focusing on improving hemodynamic, neurologic, and metabolic functions of the body in order to improve the rate of these patients being discharged from the hospital (13).

The present study showed that sex and age of the patients do not significantly affect the initial success of CPR. In contrast, Haghghi et al. showed that sex and age of the patients have a significant effect on the initial success of CPR. In addition, Alizadeh et al. (6) also reported a significant correlation between the age of the patient and the rate of CPR success. However, the results of Fei et al. study (14) were similar to the findings of the present study.

Additionally, based on the results of the present study, the ward in which the patient was hospitalized and the time interval between hospitalization of the patient and cardiorespiratory arrest of the patient did not have a significant effect on the initial success of CPR. These results are in line with those of Alizadeh et al. study (6); while, Tok et al. reported a significant correlation between CPR success and hospitalization ward (13). In the present study, although the initial success rate of CPR in the critical care unit was higher than emergency department and in emergency department it was higher than other departments of the hospital, these differences were not statistically significant. However, it is safe to say that the reason for higher CPR success rate in critical care units and emergency department compared to other departments of the hospital is the residence of an anesthesiologist and an emergency medicine specialist and continuous monitoring of the patient in these departments. The present study showed that the type of underlying illness of the patient significantly affects the initial success of CPR; so that patients that are affected with cardiorespiratory arrest following accident/trauma and intoxication have a higher rate of initial success compared to cardiovascular diseases, internal diseases, cancer and cerebrovascular diseases. Alizadeh et al. (6) and Montazar et al. (7) showed that the probability of CPR success is higher when the underlying diseases are non-cardiac, which is in line with the results of our study. The most important factor

whose correlation with the probability of success can be practically used for selection of patients that have no indication for resuscitation is their type of underlying illness.

Based on the results of the present study, the first cardiac rhythm recorded in the resuscitation sheet significantly affects the initial success of CPR; patients who have had VF/VT, have had more initial success compared to patients with asystole and PEA rhythms. Fei et al. (14) had also expressed similar results. The first rhythm in the monitor following cardiorespiratory arrest has played a significant role in the outcome of resuscitation in the present study as well as many other studies.

The present study showed that the number of resuscitation attempts had no significant effect on the initial success of CPR. Patients who had been resuscitated for the first time and more times had an equal chance of CPR success. However, the number of patients with 2 or more resuscitation attempts was limited in the present study and for more confidence, more patients should be studied. The number of CPR attempts was not evaluated in previous studies.

The present study showed that the working shift in which the patient had faced cardiorespiratory arrest did not have a significant effect on the initial success of CPR. These results are in line with those of the study by Montazar et al. (7) and Nasiripour et al. (9).

Limitations

The present study has been carried out in a single center and this affects the generalizability of the results. In this study, just the correlation of some underlying factors with probability of CPR success was evaluated and the extent to which the factor affects it was not calculated. In addition, in this study variables related with skill and knowledge of the treatment staff members were not evaluated, which definitely makes interpretation of the acquired data difficult.

CONCLUSIONS

Based on the findings of the present study, it seems that the probability of CPR success correlates with the individual's underlying illness and the initial cardiac rhythm recorded; however, it has no correlation with age, sex, hospitalization ward, time interval between hospitalization and cardiac arrest, the number of CPR attempts, or working shift.

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AUTHORS' CONTRIBUTION

All the authors met the standards of authorship based on the recommendations of the International Committee of Medical Journal Editors.

CONFLICT OF INTEREST

None declared.

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