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RESEARCH

OUTCOMES OF ELDERLY PATIENTS UNDERGOING CARDIOPULMONARY RESUSCITATION IN THE EMERGENCY DEPARTMENT: A 7-YEAR ANALYSIS ABSTRACT

ABSTRACT

Introduction: We aimed to analyze demographic and clinical characteristics, and outcomes of patients aged 65 years and older who underwent cardiopulmonary resuscitation.

Materials and Method: Data of elderly patients who underwent cardiopulmonary resuscitaion in the emergency department between January 2013 and December 2019 were scanned retrospectively. Patients characteristics, cardiac arrest location, and outcomes were recorded and analyzed.

Results: In total, 224 patients with mean age of 76.51 ± 8.23 years. A return of spontaneous circulation rate was 46.4%, and the 30-day survival rate was 7.6%. A return of spontaneous circulation rate was decreased with age. Some 86.7% of the patients had at least one comorbidity and cancer was the most common. The mean duration of cardiopulmonary resuscitation was 33.28 ± 22.16 minutes. The mean cardiopulmonary resuscitation duration in the patients who had an return of spontaneous circulation and survived was significantly lower. The pH and lactate values of the patients were found to be statistically different in patients who had a return of spontaneous circulation. The most common cardiac arrest cause was infectious diseases in 72 (32.1%) patients and the most common diagnosis in living patients was cardiac causes.

Conclusion: As the number of elderly individuals increases, and the number of comorbidities increase, the number of emergency department admissions as well as the incidence of in-hospital and out-of-hospital cardiac arrest will also increase in parallel with the increase in life expectancy.

Keywords: Heart arrest; Cardiopulmonary resuscitation; Emergency service, Hospital; Aged

INTRODUCTION

The population of elderly has been increasing globally in recent years. According to data, the elderly population aged 65 years and older constitutes 20% of the population in the USA (1). Although Turkey is composed of a comparatively young population, the increase in life expectancy worldwide is also occurring in our country. According to data from the Turkish Statistical Institute, the elderly population aged 65 years and over increased from 8.8% of the population in 2017 to 9.1% in 2019. They predict that this percentage will reach 10.2% in 2023, 20.8% in 2050, and 27.7% in 2075 (2). Consistent with this increase, the rate of admission of elderly patients to hospitals, particularly to emergency departments (EDs) and intensive care units, is also gradually increasing (3–4).

Cardiac arrest (CA) is a leading cause of death worldwide. There are approximately 375,000–700,000 CA cases in Europe annually; in the USA, there are approximately 383,000 cases over a similar period. Internationally, the survival rate for CA is low, at <14% (5–6). Since the introduction of external cardiac massage in 1960, cardiopulmonary resuscitation (CPR) has become the standard treatment for patients with a CA (7). The incidence of sudden CA increases markedly with age, from 100 per 100,000 in 50-year-old patients to 800 per 100,000 in 75-year-old patients (8). With the increase in the age of hospitalized patients, physicians are frequently confronted with the dilemma regarding whether resuscitation is a medically appropriate and ethically acceptable treatment for older patients (9).

We aimed to analyze demographic and clinical characteristics, and outcomes of patients aged 65 years and older undergoing CPR in the ED.

MATERIALS AND METHODS

This retrospective study was performed between January 1, 2013 and December 1, 2019 in the Department of Emergency Medicine of Cerrahpasa Faculty of Medicine, Istanbul Univercity- Cerrahpasa. The study was approved by the Ethics Committee of Cerrahpasa Faculty of Medicine, Istanbul University- Cerrahpasa (83045809-604.01.02- Date: December 3, 2019). Informed consent was not obtained, given the retrospective nature of the study.

Patients aged younger than 65 years, patients with incomplete data, and patients aged 65 years and older who were intubated but did not receive CPR were excluded from the study.

All data were collected from the hospital database. Age, sex, comorbidities, and complaints (in-hospital CA cases) of the patients were recorded. The patients were divided into three age groups: young (65–74 years), middle aged (75–84 years), and advanced age (≥85 years). CA location was divided into in-hospital CA (IHCA) and out-of-hospital CA (OHCA). Places within the hospital, such as the emergency room, outpatient clinic, and laboratories were understood to comprise the interior of the hospital. The duration of CPR and the return of spontaneous circulation (ROSC) were recorded. The final diagnoses of the patients were recorded. The patients' lactate, pH, and partial carbon dioxide pressure values were recorded, as well as was the 30-day survival of those patients who had ROSC.

Data were analyzed using SPSS 22.0 for Windows. The Kolmogorov–Smirnov test was used for the data distribution. Descriptive statistics were applied, and the values for quantitative data were calculated as mean ± standard deviation, whereas qualitative values were expressed as numbers and percentages. An independent sample t-test or the Mann–Whitney U-test was used to compare the means of two groups. The chi-squared test was used to compare quantitative data. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 433 patients underwent CPR between January 1, 2013 and December 1, 2019. Some

52.8% (229) of the patients were aged 65 and older. Data on 5 patients were not available; thus, a total of 224 patients were included in the study. Half of the patients were women. The mean age of the patients was 76.51 ± 8.23 years. In-hospital CA occurred in 187 (83.5%). The ROSC rate was 46.4% (104), and the 30-day survival rate was 7.6% (17). The ROSC rate in the IHCA group was 48.7%, while in OHCA group it was 35.1%. In addition, the ROCS rate in the younger group was significantly higher than in the middle and older aged groups. Some 38.5% (40) of the 104 patients who had

ROSC died within the first 24 hours, 29.8% (31) died in 2–7 days, and 5.4% (16) died in 8–30 days.

Some 86.7% (194) of the patients had at least one comorbidity. Cancer was the most common, at 34.8% (78), followed by hypertension at 33.5% (75), and diabetes at 27.7% of the patients (62). Demographic data on the patients are shown in Table 1.

The mean duration of CPR was 33.28 ± 22.16 minutes. The mean CPR duration in the patients who had an ROSC and survived was significantly

Table 1. Demographic data.

	ROSC +	ROSC -	p	Survived	Exitus	p
Age Group						
65–74	55	37		11	81	
75–84	33	54	0.004*	4	83	0.120
≥85	16	29		2	43	
Sex						
Men	49	63		6	106	
Women	55	57	0.421	11	101	0.313
Arrest Location						
IHCA	91	96		14	173	
OHCA	13	24	0.184	3	34	0.896
Comorbidities						
Present	94	100		15	179	0.838
Absent	10	20	0.177	2	28	
Cancer	35	43	0.783	3	75	0.200
HT	44	31	0.009	8	67	0.334
DM	33	29	0.207	6	56	0.573
CAD	23	20	0.302	7	36	0.025
HF	19	15	0.230	4	30	0.300
COPD	10	7	0.286	1	16	1
CVD	7	10	0.842	0	17	0.375
CRF	7	7	0.782	2	12	0.288
Alzheimer	8	5	0.260	1	12	1

*, Diffenrence between 65–74 and 75–84, ≥85 age group
ROSC, return of spontaneous circulation; OHCA, Out-of-hospital cardiac arrest; IHCA, In- hospital cardiac arrest; HT, hypertension; DM, diabetes mellitus; CAD, coronary artery disease; HF, heart failure; COPD, chronic obstructive pulmonary disease; CVD, cerebrovascular disease; CRF, chronic renal failure.

lower. The mean age of the women was significantly higher, and the mean age of the patients who had an ROSC was significantly lower (Table 2).

When the complaints from the IHCA patients were analyzed, dyspnea was the most common, at 50.6% (91), followed by nausea/vomiting, abdominal pain, and syncope (Figure 1).

The pH and lactate values of the patients were found to be statistically different in patients with successful resuscitation. There was no difference in 30-day survival between blood parameters

common diagnosis in living patients was cardiac causes in 10 patients (Figure 3).

DISCUSSION

Improvements in living conditions and healthcare in developed countries have resulted in increased life expectancy and duration; therefore, the number of elderly individuals presenting at hospitals and emergency services is also increasing. The rates of admission to EDs according to the sex of elderly

Table 2. Comparison of mean age and CPR duration.

	Age in years		p	CPR duration in minutes		p
ROSC (n, %)	Yes	No	0.016	Yes	No	0.000
	75.10 ± 8.55 (104, 46.4%)	77.74 ± 7.77 (120, 53.6%)		15.95 ± 12.59	48.30 ± 17.52	
Sex (n, %)	Men	Women	0.000	Men	Women	0.184
	74.46 ± 7.40 (112, 50%)	78.56 ± 8.54 (112, 50%)		35.25 ± 21.51	31.31 ± 22.71	
30-day survival (n, %)	Survived	Exitus	0.113	Survived	Exitus	0.000
	73.47 ± 7.67 (17, 7.6%)	76.76 ± 8.24 (207, 92.4%)		14.53 ± 12.22	34.82 ± 22.10	
Arrest location (n, %)	IHCA	OHCA	0.761	IHCA	OHCA	0.086
	76.14 ± 8.25 (187, 83.5%)	76.59 ± 8.25 (37, 16.5%)		32.15 ± 21.93	39.00 ± 22.74	

ROSC, return of spontaneous circulation; OHCA, Out-of-hospital cardiac arrest; IHCA, In-hospital cardiac arrest.

(Figure 2).

When the definitive diagnoses of patients with CA were examined according to cause, the most common causes were infectious diseases in 72 (32.1%) patients, cardiac causes in 66 (29.5%), and respiratory causes in 43 (19.2%). The most

patients generally differ by country (10–12). In our study, the proportions of men and women were equal.

The incidence of at least one comorbidity in elderly patients is 70%–83%, and hypertension, coronary artery disease, diabetes mellitus, chronic
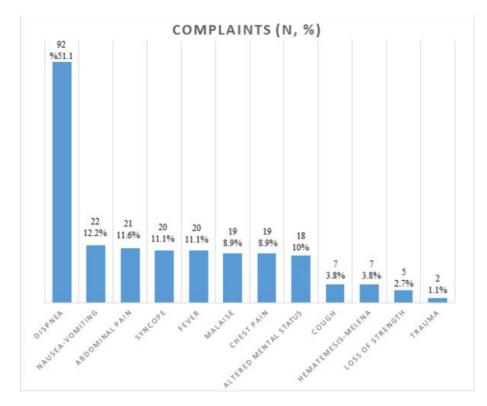
Figure 1. Distribution of the complaints of patients with IHCA.

heart failure, and chronic obstructive pulmonary disease are among the most common comorbidities (13–15). In our study, the comorbidity rate was higher than that of the other studies. Cancer was found to be the most common comorbidity, probably because our hospital is a leading hospital to monitor and treat oncological cases, especially in our region. This situation reflects higher cancer rates in the elderly population along with other comorbidities due to increased life expectancy, and might be found in EDs in CAs that develop as a result of complications related to cancer.

Socioeconomic status and comorbidity did not directly affect the outcome after CA in patients younger than 65 years of age, whereas increasing age and number of comorbidities had negatively affected ROSC and hospital survival in elderly patients (16–18). Even if there was no significant relationship between the presence of comorbidity, ROSC, and 30-day survival, except in terms of a history of hypertension in our study, higher comorbidity rates in elderly patients could be associated with a lower ROSC rate.

It is known that ROSC and survival rates are poorer in elderly patients in CA conditions in-hospital or out-of-hospital (12). The ROSC rate was between 7.7% and 48.2% in the lower age group, and was between 4.5% and 20% in the patients older than 85 years of age. However, the 30-day survival or hospital discharge rate of elderly patients decreased with age: it was between 5.2% and 20% in the younger age group and between 1.9% and 3.9% in the older age group. Despite low ROSC and survival rates in elderly patients, 12-month survival and favorable neurological outcome rates of the elderly patients who were

discharged from the hospital were 87%–92% (19–21). In our study, older individuals had lower ROSC and 30-day survival rates compared with their younger counterparts. Of the 17 survivors, 15 (88.2%) were still alive in the short-term follow up.
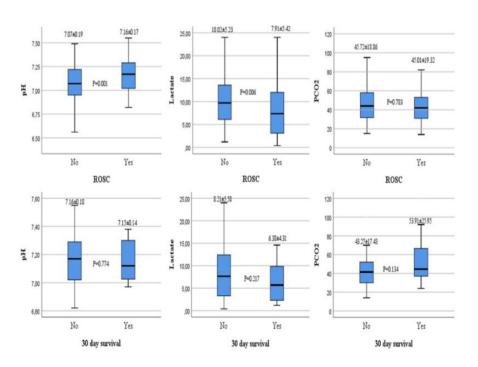
It has been reported that CPR duration was shorter in patients who had ROSC or survived. Also, the ROSC and survival rates were higher in patients with a shockable rhythm or an arrhythmia (12, 22–23), a finding consistent with the literature. We also believe that more than half of our surviving patients had CA due to cardiac causes, which might have included shockable rhythms and arrhythmias.

Dyspnea, abdominal pain, chest pain, fever, general malaise, and limb pain were the most common complaints of elderly patients at ED admission (9). In our study, dyspnea was the most common symptom in patients with CA. Myocardial infarction, arrhythmia, heart failure, and lung edema were common causes of CA in elderly patients, followed by respiratory, metabolic, and neurological causes (11, 13, 21). Even if cardiac and respiratory causes were common in our study, infectious causes were the top cause of CA. This situation could be related to the spread of infectious diseases in the winter season and complication of cancer related therapy.

Low pH values and high lactate levels were found to be associated with mortality. In addition, the mortality rate was found to be as high as 100%, especially in patients with pH values under 7.1 (24–25). In our study, high lactate levels and low pH values were significantly associated with unsuccessful CPR, however they had no effect on survival.

This study has some limitations. First, we were not able to perfom a rhythm analysis of all patients before or during CA because of OHCA cases. Second, we were not able the determine

Figure 2. Comparison of the blood gas parameters in ROSC and 30-day survival.
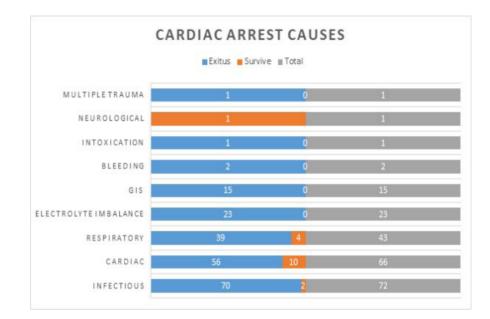
Figure 3. Distribution of the causes of cardiac arrest.

the CPR duration of the patients with OHCA. Third, long-term follow up and an assessment of detailed neurological outcomes, such as cerebral performance category scale, were not performed in our study.

In conclusion, in parallel with the increase in life expectancy, an increase in the number of elderly individuals is inevitable. As the number of elderly individuals increases, the number of ED admissions as well as the incidence of IHCA and OHCA will also increase. As age and the number of comorbidities increase in elderly patients, ROSC rates decrease, as does the chance of survival in these patients. However, considering the high rate of favorable neurological outcomes in patients who are discharged from the hospital, further studies should be conducted to determine factors that might increase the survival rates of these patients after resuscitation.

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