

Out-of-hospital cardiac arrest survival in Beirut, Lebanon

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Background Out-of-hospital cardiac arrest (OHCA) is used to evaluate the performance of the emergency medical service (EMS) system. Our study examined the characteristics and outcomes of OHCA cases presenting to a tertiary care center in Beirut, Lebanon.

Methods A retrospective chart review of all adult OHCA patients admitted to the emergency department (ED) over a 3-year period was carried out. Data collection and analysis was performed using the Utstein guidelines.

Results A total of 214 OHCA patients were presumed to have cardiac etiology; of them 205 (95.8%) underwent ED resuscitation. The mean age was 69±15.4 years. More than half of the patients (54.2%) were witnessed, but unfortunately the bystander cardiopulmonary resuscitation rate was low (4.2%). Most of them were transported by EMS (71.5%). An automatic external defibrillator was rarely used (0.9%). Asystole was the predominant presenting rhythm in ED (81.8%). Eleven patients (5.5%) survived

to hospital discharge and five (45.4%) had good neurological outcome.

Conclusion The OHCA survival rate in Beirut, Lebanon, is low. Bystander cardiopulmonary resuscitation and early defibrillation should be prioritized to achieve better outcomes. *European Journal of Emergency Medicine* 21:281–283 © 2014 Wolters Kluwer Health | Lippincott Williams & Wilkins.

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Background

Out-of-hospital cardiac arrest (OHCA) is a major cause of morbidity and mortality. Reported survival rates to hospital discharge among OHCA victims vary significantly between countries (0–30.5%) [1–3].

Several factors were found to be associated with improved OHCA survival. Demographic characteristics such as young age and male sex, in addition to event characteristics such as witnessed arrest, bystander cardiopulmonary resuscitation (CPR), modest number of defibrillations, initial rhythm of ventricular tachycardia, short time to defibrillation, and low total dose of administered epinephrine are all important variables affecting OHCA survival rates [4]. Emergency medical service (EMS) system-related factors also impact OHCA survival rate and include prompt identification of arrest, proper dispatch, rapid CPR initiation, automatic external defibrillator (AED) use, high-quality CPR, and rapid transport to an appropriate facility [5]. When combined together, these critical actions form the American Heart Association's chain of survival that aims at reducing OHCA mortality.

Lebanon has a volunteer-based EMS system lacking several essential components that are needed to achieve good outcomes for OHCA, such as medical priority dispatch, standardized training of prehospital providers, rapid response, and prompt CPR initiation [6]. AEDs are rarely available in public places or ambulances (~12% of

ambulances are equipped with AEDs) [6]. Prehospital data collection remains inconsistent and deficient [6].

Our study examined the characteristics and outcomes (such as survival to hospital discharge and neurological outcome) of OHCA cases presenting to a tertiary care center in Beirut, Lebanon.

Methods

Study setting and design

The study was conducted in the emergency department (ED) at the American University of Beirut Medical Center, the largest tertiary care center in Lebanon, with around 49 000 ED patient visits per year.

A retrospective chart review of all adult OHCA patients who were admitted to the ED between 1 July 2009 and 1 July 2012 was carried out. The study was approved by the AUB Institution Review Board.

Inclusion/exclusion criteria

To identify OHCA patients, we searched the ED database on the basis of chief complaint and ED admission diagnosis for the following terms: 'cardiac', 'arrest', 'unconscious', 'unresponsive', 'dead', 'death', 'collapse', 'seizure', and 'loss of consciousness'. All adult patients (aged 18 years and older) with no signs of circulation in the prehospital setting or on arrival at the ED were included. Exclusion criteria were: age less than 18 years,

presumed noncardiac etiology of arrest, missing ED charts, arrests transferred from other hospitals, and patients who were immediately pronounced dead on scene and for whom resuscitation was not attempted.

Data collection

Prehospital and in-hospital data were collected from the ED chart and the hospital's electronic records using the Utstein guidelines [7]. The two main outcomes reported were survival to hospital discharge and neurological outcome in the form of Cerebral Performance Category (CPC) score. The CPC score was determined from the last inpatient neurological examination before patient discharge. Scores of 1 (good recovery) and 2 (minimal disability) indicated good outcome, whereas scores of 3 (severe disability, dependent on others), 4 (persistent vegetative state), and 5 (death) indicated a poor neurological outcome [8].

Statistical analysis

The statistical package for social sciences (SPSS), version 20.0, (IBM, New York, New York, USA) was used for data entry and analyses. Descriptive analyses were carried out by calculating the number and percentage for categorical variables, whereas mean and \pm SD were calculated for continuous variables.

Results

A total of 214 OHCA cases were presumed to be of cardiac etiology. These consisted of 139 (65%) male patients and 75 (35%) female patients, with a mean age of 69 ± 15.4 years. Only one patient had return of spontaneous circulation (ROSC) on arrival at the ED. Nine patients had signs of irreversible death and were pronounced dead on arrival. Hence, 205 patients underwent ED resuscitation. More than half of the patients (54.2%) were witnessed mainly by bystanders (50.5%). Bystander CPR was documented in only nine cases (4.2%). Most of them were transported by EMS (71.5%). A total of 119 patients (55.6%) underwent prehospital resuscitation mainly by EMS providers (51.4%). Only two (0.9%) had documented AED use in the prehospital setting by EMS providers with shocks delivered. Asystole was the predominant presenting rhythm (81.8%) in ED (Table 1).

Thirty-nine patients had ROSC; 35 survived to hospital admission and four were transferred to other hospitals from the ED (all with a Glasgow Coma Scale of 3) and were excluded from survival analysis (Table 2) because of loss to follow-up. Eleven patients (5.5%) survived to hospital discharge with less than half of them (45.4%) having a good neurological outcome (CPC 1 or 2).

Prehospital time was documented to be longer for EMS than for private transports. The median time interval from collapse to ED for EMS was 28 min (IQR 15.0–40.0) compared with 15 min (IQR 10.0–22.0) for private

Table 1 Baseline characteristics of patients with OHCA presumed to have cardiac etiology

Characteristics	Cardiac etiology (N=214)
Age [mean(\pm SD)] (years)	69 (\pm 15.4)
Male sex [n (%)]	139 (65.0)
Past medical history [n (%)]	
Hypertension	99 (46.3)
Coronary artery disease	65 (30.4)
Congestive heart failure	32 (15.0)
Diabetes mellitus	60 (28.0)
Cancer	24 (11.2)
Chronic obstructive pulmonary disease	15 (7.0)
Smoking [n (%)]	
Current	28 (13.1)
Previous	22 (10.3)
No	31 (14.5)
Unknown	133 (62.1)
Prehospital information [n (%)]	
Location of arrest	
Home	127 (59.3)
Public place	41 (19.2)
Other	3 (1.4)
Unknown	43 (20.1)
Arrest witnessed	
Arrest witnessed by bystander	108 (50.5)
Arrest witnessed by EMS personnel	8 (3.7)
Arrest not witnessed	59 (27.6)
Unknown	39 (18.2)
Resuscitation attempted	
CPR attempted	119 (55.6)
CPR by bystander	9 (4.2)
CPR by EMS personnel	110 (51.4)
CPR not attempted	34 (15.9)
Unknown	61 (28.5)
Defibrillation attempted	2 (0.9)
Defibrillation not attempted	151 (70.6)
Unknown	61 (28.5)
Arrival mode	
EMS	153 (71.5)
Private transportation	48 (22.4)
Unknown	13 (6.1)
ED information [n (%)]	
Initial ED cardiac rhythm	
Ventricular fibrillation or tachycardia	23 (10.7)
Pulseless electrical activity	15 (7.0)
Asystole	175 (81.8)
Sinus	1 (0.5)
ED resuscitation	
Yes	205 (95.8)
No	9 (4.2)
Defibrillation shock	77 (36.0)
Endotracheal intubation	193 (90.2)
Intravenous line insertion	205 (95.8)
Intravenous medications administered ^a	203 (94.9)
Epinephrine	200 (93.5)
Lidocaine	17 (7.9)
Amiodarone	69 (32.2)

CPR, cardiopulmonary resuscitation; ED, emergency department; EMS, emergency medical service; OHCA, out-of-hospital cardiac arrest.

^aAdvanced cardiac life support medication.

transports. The median time interval from collapse to EMS arrival was 15 min (IQR 10.0–27.5).

Discussion

This study showed that the survival rate to hospital discharge for OHCA victims was low (about 5%) in Beirut, Lebanon. Those who survived had a less than 50% chance for a good neurological outcome.

This overall survival rate was lower than the previously reported rates in countries with developed EMS

Table 2 Survival and functional outcomes of patients with OHCA presumed to have cardiac etiology

Outcome [n (%)]	Cardiac etiology (N=205) ^a
Any return of spontaneous circulation	39 (19.0)
ROSC prehospital	1 (0.5)
ROSC in ED	38 (18.5)
Admission to hospital	35 (17.1)
ED transfers to other hospital after ROSC	4 (1.9)
Survival to hospital discharge ^b	11 (5.5)
Survivors' Cerebral Performance Category (level 1 and 2)	5 (45.4)
Length of stay at hospital [mean (±SD)] (days)	26.9 (±20.4)

ED, emergency department; OHCA, out-of-hospital cardiac arrest; ROSC, return of spontaneous circulation.

^aExcluded patients who did not undergo ED resuscitation.

^bExcluded ED transfers to other hospitals because of lack of follow-up.

systems [1,3] but is higher than the rates in countries with comparable EMS systems [2].

Several 'chain of survival' elements were missing in OHCA care in Lebanon. Low bystander CPR rates and delay in defibrillation were the main findings in our setting. Delay in defibrillation may be related to the absence of public access to defibrillators and to the inconsistent AED use by EMS providers. Although the majority of patients were transported by EMS (71.5%), only two arrests (0.9%) had a documented prehospital AED use attempt. This possibly indicated that most EMS units responded to the scene without an AED because of lack of medical priority dispatching, inconsistent AED availability, and EMS providers' reluctance to use an AED even when it is available.

The delay in EMS response time interval was another factor contributing to this low survival rate. The 15-min median for the time interval from collapse to EMS arrival at the scene was three times the 5-min response time interval benchmark used by most US EMS systems for OHCA response [9]. Delay in CPR or defibrillation exceeding 10 min had negative impacts on survival [9]. Prehospital documentation (patient record) was needed to identify the reasons for such delay.

The incidence of ventricular fibrillation, the most common initial rhythm across prehospital studies, decreased as the time taken from collapse to rhythm analysis and defibrillation reduced [10]. Asystole was the predominant presenting rhythm documented in ED in our study. Our findings suggested that the delay in resuscitation and time to reach the ED may have resulted in higher incidence of asystole as the presenting rhythm.

Our study has limitations. The first is inherent to retrospective chart reviews. Prehospital information was obtained from the ED records where documentation was inconsistent and incomplete. A second limitation relates to the Utstein template. For first rhythm, we used the first ED rhythm because of the very rare use of prehospital AEDs. We used ED instead of prehospital

resuscitation to include all transport modes. Another limitation was the loss of follow-up in patients transferred to other hospitals on the same day of ROSC. We called their families and found that three patients had died at other hospitals for the same admission; the fourth could not be reached.

Our fourth limitation is that the data were collected from only one medical center in Beirut. We assumed this sample to be representative of the overall urban population in Beirut. The impact of the in-hospital phase of treatment on OHCA outcomes, mainly survival, might be different at other Beirut hospitals, as they vary in staffing, capabilities, and services provided.

Conclusion

The OHCA survival in Beirut, Lebanon, is low. Several key elements of the chain of survival from community engagement to EMS system improvements are needed. More importantly, bystander CPR and early defibrillation in OHCA victims should be emphasized.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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