Cardiac Arrests and Outcomes at Accident and Emergency (A&E) Department in a Tertiary Care Hospital of Sri Lanka.

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Background: Witnessed cardiac arrest is a common occurrence in an A&E department. The reported incidence of witnessed cardiac arrest is variable around the world. Overall unadjusted survival to hospital discharge rate was 18.4%**. Objective:** To assess the aetiology, factors associated in outcomes of witnessed cardiac arrests, and the rate of occurrence of cardiac arrest at the A&E of Provincial General Hospital Kurunegala (PGHK). **Methods:** This descriptive study was conducted between January1, 2016, to December 31, 2016 **(**one year) at the A&E department of PGHK. Survivors were followed up on for a one-year period. **Results:** There were 123 witnessed cardiac arrests (mean age 64 (+/- 15.9) years, 64% male), out of which 25 patients were successfully resuscitated {return of spontaneous circulation (ROSC)} and transferred to intensive care units for further care. However, only 6 (4.9%) patients were discharged from the hospital. The three-month and one-year survival numbers were 6 (4.9%) (males: 4, females: 2) and 4 (3.3%) (males: 3, female: 1) respectively. The age of the female survivor after one year was 43 years and the ages of the three male survivors were 46, 54, and 55 years respectively. The most common aetiology for cardiac arrest was myocardial infarction (43.1%) while the most common initial rhythm was non-shockable (82%). The initial rhythm was shockable in all 6 survivors. **Conclusion:** The overall ratio of survival to discharge was much lower in comparison to international figures. The poor survival rate in our study may be due a very high rate of cardiac arrests with initial non-shockable rhythms.

Keywords: Accident and Emergency, Witnessed Cardiac Arrest, Resuscitation, Survival, Sri Lanka

Introduction

Unexpected and expected cardiac arrests are common in an A&E department. In a hospital, cardiac arrests often represent a failure of optimal clinical care and the severity of the illness. The reported incidence of in-hospital cardiac arrests (IHCA) is variable around the world. The overall incidence of IHCAs in the United Kingdom [2014] was 1.6 per 1000 hospital admissions, with a median across-hospital incidence of 1.5[1]. The overall unadjusted survival to hospital discharge rate was 18.4% [1, 2]. Outcome data for cardiac arrests in the A&E department is not available except in one study done in 1987 [3]. The outcome after a cardiac arrest and cardiopulmonary resuscitation (CPR) depends on several factors such as patient-related and resuscitation-related factors, critical intervention (particularly early defibrillation depending on initial cardiac rhythm), and CPR of good quality with effective uninterrupted chest compressions and assisted ventilation [1,3]. Despite considerable efforts to improve the treatment of cardiac arrest, most of the reported survival outcome data is poor. Within the available data, the first documented pulseless arrest rhythm was typically asystole or pulseless electrical activity (PEA) in both children and adults[4]. The intra-arrest factors of ventricular fibrillation/ventricular tachycardia (VF/VT) as the first recorded rhythm and shorter intervals between CPR or defibrillation are associated with higher survival chances. However, VF/VT is present in only 25-35% of IHCAs[5]. If patient outcomes are to improve, then the evaluation of the contribution of all the potential risk factors and interventions is essential [6, 7].

When there is a witnessed cardiac arrest at A&E, advanced cardiac life support can be started in seconds by the in-house CPR team. This consists of effective cardiac compressions, ECG monitoring, advanced airway management, and the setting up of intravenous/intraosseous accesses. The first monitored rhythm is the first cardiac rhythm present when a monitor or a defibrillator is attached to a patient after a cardiac arrest. The first monitored rhythm should be classified simply as shockable or non-shockable. Shockable rhythms include ventricular fibrillation and pulseless ventricular tachycardia and the non-shockable rhythms include pulseless electrical activity and asystole[7].For both

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algorithms, it is necessary to maintain CPR, ensure oxygenation, and to exclude/treat reversible causes [7]. This study, CPR was carried out according to the European Resuscitation Council Guidelines of 2015.

Objectives

This study was conducted to assess the aetiology, outcomes and rate of occurrence of witnessed cardiac arrests, at an A&E department in a tertiary care hospital of Sri Lanka.

Methods

Ethical approval was obtained from the ethical review committee of Provincial General Hospital, Kurunegala.

Design and setting:

This was a descriptive observational study with an analytical component. The study was conducted in the A&E department of Provincial General Hospital Kurunegala, Sri Lanka which serves 2.4 million people in the Northwestern Province and part of the Sabaragamuwa Province.

This study was carried out in a specific venue (A&E department) and for a specific presentation (witnessed cardiac arrest). Cardiac arrest is the cessation of mechanical cardiac activity as confirmed by the absence of signs of circulation. A witnessed cardiac arrest is one that is seen or heard by another person or an arrest that is monitored[3.] CPR is an attempt to restore spontaneous circulation by performing chest compressions with or without ventilation. Assisted ventilation is the act of inflating a patient's lungs by rescue breathing with or without a bag-mask device or any other mechanical device.

There were no rigid criteria for the discontinuation of CPR and the decision to stop CPR was taken by a senior A&E doctor who considered the duration of CPR, the patient's age, any pre-existing comorbidities, and the cardiac rhythm into account. Survivors were transferred to an intensive care unit, coronary care unit, or a general medical ward for further management. Where possible, postmortem examinations were carried out on patients who died and had no obvious cause for the cardiac arrest.

All the patients with witnessed cardiac arrests in the A&E department from January 1, 2016 to December 31, 2016 (one year) were included in the study. Patients with cardiac arrests due to trauma, pregnant women, re-arrests, and patients younger than 14 years were excluded.

Study design:

Our study had two components.

1. Component 1 - All the patients who had cardiac arrests and were included in the study that were followed-up till discharge or death.
2. Component 2 - All the survivors of the indexed cardiac arrest who were followed-up by teleconference or through meetings at the clinic by the principal investigator in one month, three months, and one year.

Study instruments:

1. Component 1- A data form, which comprised of a combination of a simplified version of the National Health Service of the United Kingdom cardiac arrest resuscitation form and an Ulstein-style cardiac arrest resuscitation form. Additionally, the demographic data of the patient, rhythm of the cardiac arrest, information on aetiology of the arrest, comorbidities, interval between initiation of CPR and recovery time, and the time taken to transport the patient to the intensive care unit, coronary care unit, or ward was obtained. A data form was pretested.
2. Component 2 - data sheets based on the Glasgow coma scale and functional status assessment of the patient to gather data on outcome during the first year after the cardiac arrest at specified intervals.

The statistical analysis was done using the SPSS 21 software package.

Results

There were 29,005 admissions (excluding trauma) to the A&E department during the study period. and 123 (0.42%) of them (age range 20-92 years) had witnessed cardiac arrests and had CPR performed on them. The patients who had witnessed cardiac arrests included 79 (64%) males (mean age 61 +/- 14.6 years) and 44 females (mean age 69 +/- 16.9 years). There were 102(83%) cardiac arrests at daytime and 21(17%) at night where survival was five in daytime where only one survived at night. There was no difference($p=0.73$) of mortality during the day and night. The average time from the cardiac arrest to the initiation of CPR and to establish a patent airway (oropharyngeal airway and ambu ventilation) was 62.4 +/- 11.8 seconds and 60 +/- 9.6 seconds respectively. Initiation of resuscitation and success at daytime and night had no difference ($p=0.264$). The time to intubation was 12.3 +/- 5.5minutesand the time to first defibrillation was 2.03 +/-1.7 minutes. The time to first adrenaline dose was 2.1 +/-1.6 minutes.

The rhythm of the cardiac arrests included asystole (n=97, 78.9%), pulseless electrical activity (n=4, 3.3%), ventricular fibrillation (n=6, 4.9%), and

ventricular tachycardia (n=16, 13%) (Table 1) There were 61 patients with cardiac aetiology for the cardiac arrests. They included 53 (43%) myocardial infractions, six (4.8%) acute heart failures, one myocarditis, and one ruptured thoracic aortic aneurysm (Table 2).

Table 1: *Rhythms of cardiac arrests*

Rhythm	Percentage (%)
Asystole	97
Pulseless electrical activity (PEA)	4
Ventricular fibrillation (VF)	6
Ventricular tachycardia (VT)	16

Table 2: *Cardiac causes of death*

Aetiology	Number
Myocardial Infarction	53
Acute heart failure	6
Myocarditis	1
Ruptured thoracic aortic aneurysm	1

Patients with a non-cardiac aetiology for cardiac arrest included 10 sepsis, nine suppurative lung diseases (eight pneumonia + one lung abscess), nine cerebro vascular accidents (six ischaemic strokes + three haemorrhagic strokes), 10 liver diseases (seven cirrhosis + three liver malignancy), five renal failures (three acute kidney injury + two chronic kidney injury), three cancers (other than liver cancer), and one anaphylaxis.

Fifty-one of them had comorbidities and only eight had multiple comorbidities. Diabetes mellitus (n=21) was the most common, followed by hypertension (n=16). Ischaemic heart disease left ventricular failure, chronic obstructive pulmonary disease, chronic kidney disease, bronchial asthma, and cerebrovascular disease were among the comorbidities. But there was no significant association of comorbidities with the deceased and only two survivors had comorbidities which were bronchial asthma and diabetes.

The initial non-shockable rhythm had a worse prognosis (P=0.0001). All survivors had ventricular fibrillation as the initial rhythm. All six survivors had a CPR duration less than 20 minutes, except for one patient who had survived at one year who was 54 years old and had (ST Elevation myocardial infarction) STEMI who had a resuscitation time of 40 minutes with 24 defibrillations.

Mortality of cardiac arrests in the A&E department was 80% (98/123) while the in-hospital mortality rate was 95% (117/123). Though returned of spontaneous circulation (ROSC) was in 25 patients at A&E, only six survived after sending to intensive care units/wards and went home. All survivors Glasgow coma scale (GCS) was 15/15 on discharge except one who discharged with GCS of 10/15 who survived for 90 days with same GCS and succumb to death following an aspiration pneumonia and pressure sore in 95 days of discharge. The overall survival of the witnessed cardiac arrest was 6 (4.9%) at the time of discharge from the hospital, 6 (4.9%) at 30 days, 6 (4.9%) at 90 days, and 4 (3.2%) at the one-year mark. Four of them were in good health and GCS of 15/15 in one year.

Discussion

Cardiac arrests are complex scenarios to assess. It is very difficult to find background information when a patient is in a life and death condition. Short, targeted history-taking during resuscitation is the only opportunity to document any comorbidities. It is a very difficult and emotional task to ask for detailed comorbidity history from the bystander while a patient is being resuscitated. Rate of occurrence of cardiac arrests in A&E, is low and it is unable to compare with in-hospital arrest due to lack of data. Most cardiac arrests in our study were due to cardiovascular causes and mainly due to myocardial infarction. Although a considerable number of patients were successfully resuscitated at the A&E department, the survival outcome at discharge was very low despite timely initiation of CPR. This is mainly due to an increased occurrence of initial non-shockable rhythms when compared to other studies [4,5] which led to a longer duration of resuscitation (>20 minutes). Successful outcomes were lower in our study when compared to other studies, but those studies were on inward patients and not on A&E patients[8]. A&E patients are a different cohort of patients who usually attend with more dire emergencies than inward patients. CPR durations of less than 20 minutes and people with shockable rhythms had better outcomes. It is difficult to arrive at a conclusion because the number of survivors was very low. Patient and the rescuer characteristics can have influence on a case-by-case basis.

Recommendations

Maintaining special resuscitation forms for the documentation of CPR rather than documenting them in the patient's notes, with detailed comorbidities, and having supervisors at the time of CPR will increase the efficacy and accuracy of the

management of CPR. It will give an answer to poor outcome with faster initiation of resuscitation in this setting. Although time consuming, analyzing each event with the team involved in CPR will provide good feedback and a positive attitude for future events. Maintaining special forms and having supervisors will help to better understand how patients' characteristics interface with rescuer training, experience, technical tools, and skills to address and overcome specific challenges during resuscitation. Timely, advanced life support and basic life support training and retraining along with updating the knowledge of the health care team will improve the quality and effectiveness of CPR. Redesigning a similar study with a multicenter dataset is mandatory to assess the real situation of the country and this can be achieved once we have a nationwide uniform system of documenting cardiac arrests.

Limitations

We were unable to comment on cardiac arrests secondary to trauma, children and pregnant women as they were excluded from our study population.

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