Outcome of In-hospital Cardiac Arrest And Its Relation To Quality of Cardiopulmonary Resuscitation

Thesis

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Abstract

Introduction: Cardiopulmonary resuscitation (CPR) is a lifesaving intervention and the cornerstone of resuscitation from cardiac arrest and when performed according to the international guidelines has a vital impact on survival of cardiac arrest (CA). The Utstein template (UT) has been used internationally to objectively evaluate different variables of CPR quality and outcome. Objective: Determine outcomes of cardiopulmonary resuscitation (CPR) in the form of return of spontaneous circulation (ROSC) and survival to hospital discharge in Maadi Military hospital also to determine adherence to evidence-based CPR guidelines.

- . **Methods:** A prospective observational study of 134 IHCA from 1st of December 2012 and through May 2013 out of 3498 patients admitted in the different departments at Maddi Military hospital, using a modified UT. **Results:** CPR was attempted in 129 cases (96.3%) the remaining 5 cases one of them was found dead and the other 4 were considered futile . CA was witnessed in 124 (92.5%) and monitored in 114 cases (85.1%) .The initial rhythm was brady-asystole in 98 cases (73.1%) brady-asystole 98 cases (73.1%) and PEA in 3% 0f cases. ROSC was achieved in 54 cases (41.9%). Survival to hospital discharge (STHD) was achieved in 22 cases (16.4%); none of them had neurologic deficit. **Conclusion:** The survival rate to hospital discharge was appropriate (16.4%) compared to other studies.ROSC was achieved in 41.9% of cases which was almost equivalent to other studies Relatively poor post cardiac arrest care (eg. no therapeutic hypothermia) Monitored arrest, 1st responder CPR, time interval from collapse and 1st DC shock were independent predictors of ROSC. Monitored arrest 1st responder CPR, shockable rhythm and age were predictors of survival

Keywords: in- hospital cardiac arrest, cardiopulmonary resuscitation, ROSC

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Content

List of Abbreviations

AC : Alternating Current
ACD : Active Compression Decompression
ACLS : Advanced Cardiac Life Support
ACS : Acute Coronary Syndrome
AED : Automated External Defibrillator
AHA : American Heart Association
ALS : Advanced Life Support
AMI : Acute Myocardial Infarction
ANZCOR : Australia and New Zealand Committee on Resuscitation
ARC : Australian Resuscitation Council
ATVs : Automatic Transport Ventilators
BLS : Basic Life Support
CA : Cardiac Arrest
CAD : Coronary Artery Disease
CCF : Chest Compression fraction
CCU : Coronary Care Unit
CHF : Congestive Heart Failure
CNS : Central Nervous System
COPD : Chronic Obstructive Pulmonary Disease
CPAP : Continuous Positive Airway Pressure
CPC : Cerebral Performance Category
cpm : Compressions per minute
CPR : Cardiopulmonary Resuscitation
CT :Computed Tomograhy
CVA : Cerebrovascular Accident
DC : Direct Current
DNAR : Do Not Attempt Resuscitation
ECC : Emergency Cardiovascular Care
ECMO : Extracorporeal membrane Oxygenator
EEG : Electroencephalogram
EIT : Education, Implementation and Teams
EMS : Emergency Medical Services

EPI : Epinephrine
ERC : European Resuscitation Council
$ETC0_2$: End- Tidal Carbon Dioxide Concentrations
GCS : Glasgow Coma Scale
HSFC : Heart and Stroke Foundation of Canada
IABP : Intraaortic Balloon Pump
ICD : Implantable Cardioverter Defibrillator
ICU : Intensive Care Unit
IE : Infective Endocarditis
IHCA : In-Hospital Cardiac Arrest
ILCOR : International Liaison Committee on Resuscitation
Inc. : Incorporation
IO : Intraosseous
ITD : Impedance Threshold Device
IV : Intravenous
LMA : Laryngeal Mask Airway
LUCAS : Lund University Cardiac Arrest System
LVAD : Left Ventricular Assist Device
NRCPR : National Registry on Cardiopulmonary Resuscitation
OHCA : Out- of Hospital Cardiac Arrest
OPC : Overall Performance Category
PCI : Percutaneous Coronary Intervention
PE : Pulmonary Embolism
PEA : Pulseless Electrical Activity
PETCO2 : Partial Pressure of Exhaled $C0_2$
PLS : Pediatric Life Support
QI : Quality improvement
RCSA : Resuscitation Council of Southern Africa
RHD : Rheumatic Heart Disease
ROSC : Return of Spontaneous Circulation
VAM : Voice Advisory Manikin
VF : Ventricular Fibrillation
VT : Ventricular Tachycardia

List of Tables

List of Figures

List of Tables

INTRODUCTION

Resuscitation is the art of restoring life or consciousness of one apparently dead.[1] Cardiopulmonary resuscitation (CPR) is a lifesaving intervention and the cornerstone of resuscitation from cardiac arrest.[2] The treatment of cardiac arrest (CA) with cardiopulmonary resuscitation (CPR), including mouth-to-mouth ventilation and external chest compression, today widely known as basic life support (BLS), was described in the 1950s.[3]

In-hospital cardiac arrest is a major public health problem. During 2005 and 2006, more than 21 000 in-hospital cardiac arrests were reported to the AHA NRCPR from approximately 10% of the hospitals in the United States. [4]

Survival from cardiac arrest depends on early recognition of the event and immediate activation of the emergency response system, but equally critical is the quality of CPR delivered. Both animal and clinical studies demonstrate that the quality of CPR during resuscitation has a significant impact on survival and contributes to the wide variability of survival noted between and within systems of care. [5]

For more than 30 years, researchers have published many studies on survival after in-hospital CPR. Until recently no clear picture of success had emerged. DeBard reported survival rate of 39% at 24 hours and 17% at discharge to home. [6] Cummins and Graves reviewed 44 studies and calculated survival rates to hospital discharge that ranged from 3% to 27% following an in-hospital cardiac arrest (IHCA).[7] Such

wide variations in the rate of survival are explained by marked differences in inclusion criteria and outcome definition.

The international Liaison Committee on Resuscitation (ILCOR) was chartered on November 22, 1992, aiming to identify and review international science and knowledge relevant to CPR and emergency cardiovascular care and when there is consensus to offer treatment recommendations. Since 2000, researchers from the ILCOR member councils have evaluated resuscitation science in 5-yearly cycles with the latest being the 2010 international consensus conference which involved 313 experts from 30 countries. **(8,9)**

Outcome from cardiac arrest remains an important field of research. This especially applies to a developing countries like Egypt, where there is a lack of appropriate statistics of resuscitation outcomes and illiteracy. The ethics of resuscitation and end-of-life decisions which are generally influenced by local cultural, traditional, religious, social and legal factors are also defective in Egypt. By doing a survey on in-hospital cardiac arrest in large Egyptian hospitals, we could have a road to a nationwide database of in-hospital resuscitation events, to identify opportunities to improve quality of care.

AIM OF THE WORK

The aim of the study was to:

1) Determine outcomes of cardiopulmonary resuscitation (CPR) in the form of return of spontaneous circulation (ROSC) and survival to hospital discharge in Maadi Military hospital.

2) Determine adherence to evidence-based CPR guidelines.

CHAPTER I

Epidemiology of Cardiac Arrest

Cardiac arrest, also known as cardiopulmonary arrest or circulatory arrest, is the end of normal circulation of the blood due to failure of the heart to contract effectively. **(10)**

Incidence:

Despite important advances in prevention, cardiac arrest remains a substantial public health problem and occur both in and out of the hospital. **(11)**

In the US and Canada, approximately 350 000 people/year (approximately half of them in-hospital) suffer a cardiac arrest and receive attempted resuscitation. **(12)**

Data from 37 communities in Europe indicate that the annual incidence of EMS-treated out-of-hospital cardiopulmonary arrests (OHCAs) for all rhythms is 38 per 100,000 population. **(13)**

Intensivists are frequently involved in the management of in-hospital cardiac arrests (IHCAs), either as members of cardiac arrest teams (CATs) or to provide post resuscitation care. **(14)**

Few studies have reported the incidence of IHCA. The incidence can be calculated either as the number of events per hospital beds per year or as the number of events per number of patient admissions. The first approach gives an estimate of the number of the expected events in a single institution, while the second method takes into account the