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ORIGINAL ARTICLE

Quality of cardiopulmonary resuscitation of in-hospital cardiac arrest and its relation to clinical outcome: An Egyptian University Hospital Experience

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KEYWORDS

Cardiopulmonary resuscitation (CPR);
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Survival to discharge;
Adherence to CPR guidelines;
Utstein template

Abstract *Introduction:* High quality cardiopulmonary resuscitation (CPR) performed according to international guidelines has a vital impact on survival of cardiac arrest.
Objective: To investigate different variables affecting return of spontaneous circulation (ROSC) and survival to discharge (STD) after in-hospital cardiac arrest (IHCA) and evaluate adherence to CPR guidelines using a modified Utstein-style template.
Methods: A prospective observational study of 126 IHCA out of 5479 admissions to cardiology units of 3 Cairo University hospitals.
Results: CPR was not attempted in 7 futile cases. ROSC was achieved in 50.4%, while STD was achieved in only 7.6% of 119 attempted resuscitations. CPR was started by a physician in 114 cases (95.8%) and by the on duty nurse in only 5 cases. The initial rhythm was shockable rhythm (SR) in 19 cases; 13 (68.4%) of whom achieved ROSC and 6 (31.6%) STD and non SR (pulseless electric

Abbreviations: CPR, cardiopulmonary resuscitation; CA, cardiac arrest; CAD, coronary artery disease; DC, defibrillation/cardioversion; DNAR, do not attempt resuscitation; HF, heart failure; IHCA, in hospital cardiac arrest; IV, intravenous; PEA, pulseless electrical activity; ROSC, return of spontaneous circulation; SR, shockable rhythm; STD, survival to discharge; VF, ventricular fibrillation; VT, ventricular tachycardia

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activity/asystole) in 100 cases; 47 (47%) of whom achieved ROSC and 3 (3%) STD. Chest compressions were observed appropriate $\geqslant$100/min, $\geqslant$2 inches deep and interrupted $<$10 s in 99.2%, 92.4% and 48.7% of cases respectively. Initial SR and duration of CPR were independently associated with ROSC (both $P = 0.01$) and STD ($P = 0.008$ and 0.02 respectively). A cut-off value for CPR duration of 22.5 min had a sensitivity of 86.7% and a specificity of 81.4% in predicting ROSC by receiver-operator characteristics analysis.

Conclusion: The poor STD despite a relatively good ROSC calls for improvement of CPR education and training for hospital personnel and better post CA care.

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1. Introduction

Despite the wide availability of detailed comprehensive cardiopulmonary resuscitation (CPR) guidelines as well as regular training programs prepared by different national and international societies, the reported rates of survival to discharge (STD) in different studies of in hospital cardiac arrest (IHCA) are low.[1–3] A metaanalysis of 51 IHCA studies showed a STD between 13.4% and 14.6%.[4] In studies by Peberdy et al.[5] and Danciu et al.[6] patients survived to discharge in 17% and 15.1% of IHCA respectively. In order to improve this low survival rate, the various factors influencing the clinical outcome of CA should be identified and studied. A well performed CPR has been shown in animal and human studies to have a positive impact on survival.[7–9] Two studies found that the quality of different in-hospital CPR parameters such as the chest compression depth and rate, did not conform with published guidelines even when performed by well-trained hospital staff.[10,11] In anotherstudy,[12] the location of patient in a critical care area, an initial shockable rhythm, and length of resuscitation were independently associated with STD. To facilitate reporting of the different potential risk factors and interventions that could influence the clinical outcome of IHCA, the International Liaison Committee on Resuscitation (ILCOR), updated and simplified the Utstein-style definitions and reporting template for IHCA in 2004.[13] The objectives of this study were to evaluate the quality of CPR and the adherence to CPR guidelines and investigate the different variables affecting return of spontaneous circulation (ROSC) and STD after IHCA using a modified Utstein-style template.

2. Methods

2.1. Setting

This study was done in the cardiology units of 3 Cairo University hospitals: Kasralainy public hospital (KH), New Kasralainy teaching hospital (NKH) and El manial specialized hospital (ESH). Data on 126 IHCA were collected between March and through November 2012 out of 5479 admissions to these cardiology units.

2.2. Study design

The study protocol was approved by the ethics committee of the Faculty of Medicine, Cairo University. It was a prospective observational study of IHCA. On recognition of CA, the code blue team which included the on call cardiology resident, available senior cardiology registrars and allocated nurses immediately initiated basic and advanced life support measures.

2.3. Inclusion and exclusion criteria

This study included all patients $\geqslant$18 years old who sustained an IHCA The exclusion criteria comprised patients brought to the cardiology unit for pronouncement of death, and IHCA outside the cardiology units.

2.4. Collection of data

A modified in-hospital "Utstein style" template,[13] was distributed to the cardiology units in the 3 Cairo University Hospitals. The data for every arrested patient was collected by the resident physician who managed the CA and recorded using this template. The template allowed collection of 3 major variable categories: patient variables, event variables and outcome variables.

2.5. Study outcomes

The study primary outcomes were ROSC and STD. The study secondary outcomes were the quality of CPR and adherence to international CPR guidelines.[1] The senior physician who attended the CA (usually certified in basic and advanced life support) acted as an observer and reported the quality of chest compressions: rate, depth and interruption pauses $>$10 s, medication timing and dosing, use of defibrillation when indicated, and airway management. Any deviation in care from standard international CPR guidelines[1] was reported. The first five minutes of the CA were observed in 60-s segments. To calculate the rate of compressions/minute, the average rate of these five 60-s segments was calculated.

2.6. Statistical methods

Data were collected, revised, coded and downloaded to the statistical package for social science (SPSS version 15.0.1 for Windows; SPSS Inc, Chicago, IL, 2001). Qualitative data were presented as numbers and percentages while quantitative data were presented as mean, standard deviations and ranges. Accuracy was represented using the terms sensitivity, and specificity. Receiver operator characteristic (ROC) analysis was used to determine the optimum cut off value for duration of CPR in predicting ROSC. Univariate logistic regression was used

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