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Evaluation of in-hospital Cardiopulmonary Resuscitation

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Objectives: To assess in-hospital cardiopulmonary resuscitation at Salmaniya Medical Complex (SMC).

Design: Retrospective study.

Setting: The study was done in SMC.

Method: Cardiopulmonary resuscitation (CPR) forms of all patients needing CPR during 6 month period from June to November 2002 were reviewed for accuracy, completion and outcome of CPR.

Results: A total 207 cardiopulmonary arrest were identified, 184 (88.9%) CPR were done for medical patients and 23 (11.1%) for surgical patients. There was no significant difference between medical and surgical patients regarding sex or age. Pre-arrest diagnosis was only mentioned in 161 (78%) CPR forms. The arrest rhythm was recorded in 104 (50.2%). Asystole 60/104 was the most common rhythm of arrest. Defibrillator was used for 27 (13%), only 10 patients showed good response. Forty-nine (23.7%) achieved return of spontaneous circulation (ROSC) within 24 hour, 20 (9.6%) had one month survival and 15 (7.2%) were discharged alive. Our survival rate is 23.7% at 24hour and is 7.2% at hospital discharge.

Conclusion: The CPR team in SMC is not following the standard guidelines of in-hospital cardiopulmonary resuscitation.

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The Emergency Cardiac Care (ECC) Committee of the American Heart Association first published guidelines for CPR and ECC in 1974[1]. Updated in 1980, 1986 and 1992. The American Heart Association (AHA) guidelines are now recognized as the world's most accepted resuscitation guidelines[2-4]. Hospitals need guidelines for resuscitation rather than depend on the skills of individual professionals. The chain of survival, first conceptualized for out-of-hospital sudden cardiac arrest, applies to in-hospital arrest as well[5,6]. Successful resuscitation requires early recognition of cardiopulmonary arrest, early activation of CPR team, early CPR; early defibrillation

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when indicated and early advanced cardiac life support. All resuscitation efforts should be documented accurately by recording specific treatment interventions, event variable, and outcome variables. Resuscitation teams designate a specific recorder to provide event documentation. The in-hospital Utstein-style guidelines provide a standard reporting form for in-hospital CPR[7]. The aim of this study is to assess the cardiopulmonary procedures at Salmaniya Medical Complex.

METHODS

A retrospective from June to November 2002 based on the data reviewed from the cardiopulmonary resuscitation forms – form No. 45500397 R/1/92. All CPR forms were collected from quality management department. Charts of all patients needing resuscitation during 6 month period were reviewed, excluding those occurred in intensive care unit, accidental/emergency and pediatric wards. CPR forms were not available in all wards of Salmaniya Medical Complex. There were no CPR forms for patients who developed cardiac arrest in intensive care unit (ICU), Emergency (A/E) and in pediatric ward. All CPR forms were reviewed for patient's characteristics: age, gender, nationality and pre-arrest diagnosis; for event variables: arrest rhythm, airway management, the use of defibrillator, lastly outcome variables and survival rate. Only patients who had return of spontaneous circulation more than 24 hours (ROSC>24h) were considered as a successful CPR, while those who could not achieve ROSC>24h were considered as unsuccessful CPR. Over six month period there were 207 in-hospital cardiopulmonary arrests, all were divided into medical group where resuscitation were performed in medical wards and surgical group where resuscitation were performed in surgical wards. Statistical analysis was done using SPSS7.5. Chi-square was used to analyze group differences for categorical variables and student t-test for continuous variables. P value of <0.05 was considered significant.

RESULTS

Table 1.

Table 2.

Two hundred and seven CPR procedures performed in medical and surgical wards. Hundred and eighty four (88.9%) CPR were done for medical patients and 23 (11.1%) for surgical patients. Table 1 shows 137 (66.2%) male patients, 122 medical and 15 patients were surgical, while 70 (33.8%) were female, 62 were medical and 8 were surgical patients. There was no significant difference between medical and surgical patients regarding sex or age group ($P>0.05$). Table 1 also showed a significant difference between Bahraini and Non-Bahraini patients who developed cardiopulmonary arrest ($P=0.029$), CPR were more common in Bahraini patients. Incomplete CPR records were noticed in many forms and in most of them time of the CPR team arrival was documented as the time of arrest. The pre-arrest diagnosis was mentioned in 161 (78%) forms Table 2. The highest percentage of recording pre-arrest diagnosis was in September 88% (33/34). The duration of arrest was missed in some forms. The type of arrest was recorded in 104 (50.2%) CPR forms (Table 3). Various types of arrest were recorded. A systole was the most common rhythm of cardiac arrest 60 out of 104 patients, (Fig 1). Regarding airway management there was no significant difference between medical and surgical patients ($P>0.05$).

Table 3.

Table 4.

Figure 1.

Airways with endotracheal tube, was secured in 197 (95.2%), 176 medical and 21 surgical patients. Ten patients (4.8%) had no secured airway – 8 were medical and 12 were surgical (Table 4). Defibrillator was used for 27(13%) patients, 24 medical and 3 surgical (Table 4). Out of 27 patients, only 10 (36%) showed good response, while 17 patients (64%) did not respond to defibrillation. Forty-nine patients (23.7%) had successful CPR, ROSC > 24hr ere achieved. Out of 49 patients, only 20 (9.6%) were able to survive one month post-CPR and 15 (7.2%) discharged alive. These are 14 medical and one surgical. Table 5 shows no significant difference between medical and surgical patients regarding outcome (P>0.05). Table 6 shows a significant increase in the number of patients with ROSC > 24hr, post-CPR one month survival P=0.002 and those discharged alive P=0.001. There was an increase in survival rate of patients <65years than those >65 years (Fig 2).

Table 5.

Table 6.

Figure 2.

Our survival rate was 23.7% at 24hr and 7.2% at hospital discharge (Fig 3).

Figure 3.

DISCUSSION

The success and acceptance of the out-of-hospital Utstein-Style recommendation led the AHA to develop a specific recommendation for documenting in-hospital resuscitation[8]. The in-hospital Utstein guidelines provide a standard reporting form for in-hospital CPR[7]. To develop these guidelines, the task force defined a net of data element that is essential or desirable for documenting in-hospital cardiac arrest. Data categories are hospital variables, patient variables and outcome variables (Fig 4).

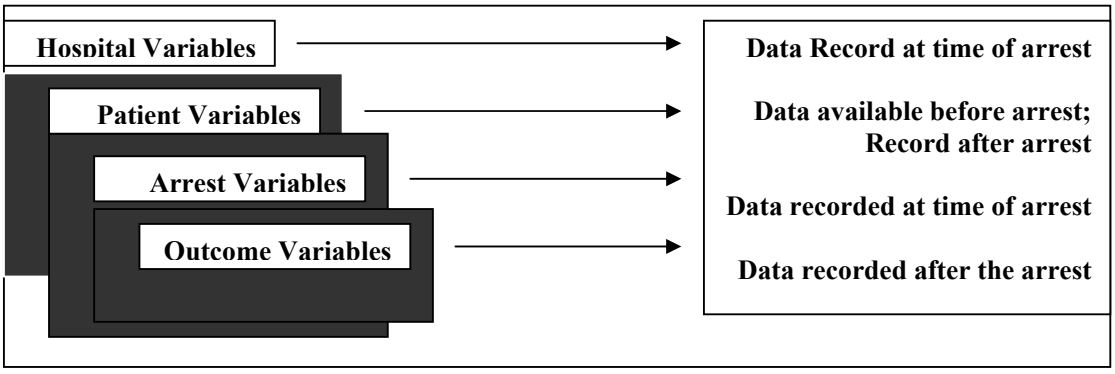

Figure 4. Four major categories of variables for documenting in-hospital resuscitation.

Most of the records in this study were incomplete and inaccurate and did not follow the Utstein-style reporting of in-hospital arrest. The result shows that most of the reviewed CPR forms covered the patient variables: age, gender and nationality. There was no significant difference between males and females in medical and surgical patients regarding outcome. Researchers have paid increasing attention to the role of the gender in cardiovascular diseases in term of risk factors and outcomes[9,10]. The racial mix of patients in different countries varies significantly, any group accounting for a small proportion of a study population will produce data that can be analyzed meaningfully and this in agreement with our findings where there was significant difference between Bahraini and non-Bahraini patients who developed cardiopulmonary arrest[11]. Age alone was not shown to be an independent determinant of survival[12,13]. In this study there was no difference between patients with less than and more than 65years in medical and surgical groups regarding incidence of cardiac arrest. There was definite increase in survival rate for those <65 years. These findings are similar to Juches and Tresh[13,14]. Pre-arrest diagnosis will strongly influence resuscitation outcomes[15]. In spite of pre-arrest diagnosis was mentioned in 78% of CPR forms, it was not significantly affecting the outcome. Hallstrom had a record of 100% pre-arrest diagnosis and it was not significant either[15]. Only one published study of in-hospital arrest considered the pre-arrest diagnosis as significant[13]. This is an important area for future research and this issue of pre-arrest diagnosis should not be ignored. The event variables are: event time, time of collapse, time of call for help, CPR team arrival, time CPR started, time CPR stopped, time of each interventions, time of return of spontaneous circulation (ROSC) and event intervals. Event variables are recommended for interhospital and intrahospital comparisons.

Majority of these variables were not recorded in CPR forms in this study. In few of them, there were record but were incomplete and inaccurate. The arrest rhythm was reported in only 104 (55.2%) of cases. The effect of the presence of arrest rhythm records, we found that there is a significant increase in the number of patient who achieved ROSC>24hours, one month survival and discharged alive. This can be explained by a proper management and interventions when the arrest rhythm was known to CPR team. In this study 95.2% of patients had secured airway with endotracheal tubes and there was no significant difference between those with secured and unsecured airway in medical and surgical groups. The defibrillator was used for 27 patients (13%). Out of 27 patients, 10 patients (36%) showed good response, this explains the importance of early defibrillation as a link of chain of survival for prediction of CPR outcomes.

For more than 30years researchers have published many studies on survival after in-hospital cardiopulmonary resuscitation. Until recently no clear picture of success had emerged. Three major reviews of more than 50 published articles on survival rate after in-hospital cardiopulmonary resuscitation have demonstrated wide variation in survival[16,17]. Mc Grath calculated survival rate of 38% at 24 hours and 15% (3 – 17%) at hospital discharge[16]. De Bard reported survival rates of 39% at 24 hours and 17% at discharge[17]. Cummins and Graves reviewed 44 studies and calculated survival rates to hospital discharge that ranged from 3% to 27% following in-hospital cardiac arrest[18]. Huang reported survival rate of 17% at discharge and 4% alive at one year [19].

Peberdy et al reviewed 14720 cardiac arrests and calculated survival rate of 17% at discharge[20]. Demet Tok reported 27.2% survived immediately post-resuscitation and 11.7% survived to hospital discharge [21].

In this study we report a survival rate of 23.7% at 24 hours and only 7.2% at hospital discharge. Such wide variation in the rate of survival is explained by correct inclusion of the criteria and outcomes definition. Our low survival rate at 24 hours and at discharge can be explained by lack of the standard methods of recording, auditing and clinical trials.

CONCLUSIONS

To assist hospital in adopting these in-hospital uniform guidelines most of the essential variables have been incorporated into a form titled "Standard Reporting of In–Hospital Cardiopulmonary Resuscitation". Resuscitation is a topic of immense complexity. We found the purpose of this document is as much to list topics for consideration as to provide guidelines to follow.

Recommendations

- **Standard reporting form provide documentation of patient care during arrest.**
- **CPR form to be universal in Salmaniya Medical Complex emergency**
- **Using standard algorithms approved by American Heart Association for management of cardiopulmonary resuscitation**
- **CPR forms and should cover all variables: hospital variables, patient variables, arrest variables and outcomes variables.**
- **Cardiac arrest (CPR) committee in Salmaniya Medical Complex expands their mandate beyond structures and process concern for individual patients.**
- **Hospital should strongly encourage all personnel participating in a resuscitation to have advanced cardiac life support (ACLS) courses.**
- **Outcomes information as resuscitation, discharge rates, functional levels of survivors and length of survival are all important parameters to assess.**

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