Survival after in-hospital cardiopulmonary resuscitation in a major referral center

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INTRODUCTION

Cardiopulmonary resuscitation (CPR) has been widely practiced since the clinical utilization of closed chest massage was first reported in 1960.1 Initial survival after CPR may exceed 50%, but hospital discharge rates are much lower.2 Studies from the 1990s have noted hospital CPR discharge rates of 13–14%,4,5 and a more recent Canadian study reported similar findings.6 Using the data from 14,720 in-hospital cardiac arrests in the National Registry of Cardiopulmonary Resuscitation (NRCPR), Peberdy et al.4 have reported overall survival to hospital discharge of 17%. A 17% survival rate to discharge was also reported by Tunstall-Pedoe et al.7 who included arrests with onset outside the hospital. Recently, Nadkarni et al.8 analyzed several years of NRCPR data to compare the survival outcomes of children and adults after cardiac arrest associated with different arrest mechanisms. Using survival to discharge as the primary outcome measure, the latter author found a rate of survival of 18% for adults after pulseless cardiac arrest. Matot et al.9 also prospectively studied the effect of arrest time with hospital discharge as the primary outcome measure, and their finding is that survival to discharge was poorer after night shift CPR than after combined morning and evening shifts. Cardiac–respiratory arrest is a foremost problem in many medical centers worldwide and CPR is part of the responsibility of the code blue anesthesia team and anesthesia department. This study was undertaken to assess the demographics, clinical parameters and outcomes of patients undergoing CPR by the code blue team at our center.

MATERIALS AND METHODS

Data relevant to CPR outcome in 313 hospitalized patients coded blue (code 99) at our hospital were gathered and analyzed. Regarding the various wards, the internal medicine ward, surgery ward, clinic, paraclinic, emergency (ER), ICU,
RESULTS

Data were collected retrospectively from all patients who underwent CPR at our hospital from 2007 to 2008. CPR was performed on 290 patients; 125 were females (43.1%) and 165 were males (56.9%). CPR was done 313 times. The patients were aged 3 to 78 (average 59.6) years. There were 33 patients under 30 years (11.4%); 78 cases were aged 30–60 years (26.9%) and 179 cases (61.7%) were above 60 years of age. The success rate was greater in males OR = 1.062, CI=95% (0.65, 1.74); 54 cases (17.3%) were in the internal medicine ward, 63 cases (20.1%) in the surgery ward, 1 case (0.3%) in the clinic, 11 cases (3.5%) in the paraclinical, 116 cases in the emergency room (ER) (37%), 55 cases (17.6%) in the ICU and CCU, and 13 cases (4.2%) were in other wards [Table 1]. Clinical outcomes of interest were survival at the end of CPR and survival at discharge from the hospital. Factors associated with survival were evaluated using t-test and chi-square test. Multiple CPR was required in 23 patients [Table 2] (7.9%). Of the 290 patients included, 95 patients (30.4%) were alive after CPR and 35 (12%) were alive at discharge. The ER had the most cases of CPR. Two hundred thirty-four cases were resuscitated from 7 a.m. to 7 p.m. and 56 underwent CPR between 7 p.m. and 7 a.m. CPR in day shifts (7 a.m.–7 p.m.) was significantly higher than that during night shifts OR = 1.47, CI = 95% (0.8, 2.7), indicative of the fact that more invasive procedures are done in day shifts. Additionally, 53 cases (18.3%) were resuscitated on holidays and 237 (81.7%) on working days. CPR on working days was significantly higher than that during night shifts OR = 1.47, CI = 95% (0.8, 2.7), indicative of the fact that more invasive procedures are done in day shifts. Additionally, 53 cases (18.3%) were resuscitated on holidays and 237 (81.7%) on working days. CPR on working days was significantly higher than on holidays (P < 0.0001).

The duration of CPR was 10 minutes or less in 95 cases (30.4%), 10–20 minutes in 49 cases (15.7%), 20–30 minutes in 81 cases (25.9%) and 30–60 minutes in 88 cases (28%). Duration of CPR >10 minutes was predictive of significantly decreased survival to discharge (P < 0.0001).

Cardiac massage only (most cardiac arrests) was done in 133 (42.5%) patients, defibrillation via electroshock (i.e., ventricular fibrillation, ventricular tachycardia, etc.) in 3 (1%) patients and both in 177 (56.5%) patients.

Intubation was required in 124 cases (39.6%) and mechanically assisted ventilation with intubation in 189 cases (60.4%).

DISCUSSION

This study was undertaken at a major referral hospital with 800 beds and all subspecialties and full array of diagnostic and treatment facilities. Over 100 operations (average) are performed daily at this center (including cardiac surgery). An average of 0.7–1 case of CPR is seen daily at the general wards. CPR is more common in males than females; 61.7% of patients are in their sixth decade. CPR in day shifts was more than night shifts possibly because the interventions and procedures that may induce cardiac arrest were done in day shifts. Overall survival to discharge after in-house CPR in the current study was similar to that of previous studies. [6,8,10]
The prevalence of ventricular fibrillation or ventricular tachycardia was 11.5% in the current study, ventricular tachycardia was 20.3% in the previous study and prevalence of asystole was 68.8%. In one study, asystole was 71% and pulseless activity (PEA) was 25%. These findings are similar to those of Nadkarni et al. who reported 23% prevalence of ventricular fibrillation or ventricular tachycardia, and asystole and PEA prevalence of 35% and 32%, respectively, in adults. Cardiac massage was done in 133 patients (42.5%), defibrillation via electroshock in 3 patients (1%) and both in 177 of our patients (56.5%). Discharge after initial pulseless rhythm of ventricular fibrillation (28% (or ventricular tachycardia (13%) in a previous study) was similar to previous findings of Cooper et al. (survival of 33 and 31% with these initial rhythms, respectively. An initial observed rhythm of either ventricular fibrillation or tachycardia in adults has been reported to be favorable for survival to discharge compared to other rhythms.

Multiple cardiac arrests have not been isolated as a predictor of poor outcome in some studies. Nadkarni studied only the first, or index, arrest. Bialecki and Woodward found 18% survival of a second CPR and stated that a patient who has survived initial CPR should be considered for a second resuscitation if clinically warranted; but they did not consider multiple arrests as a factor influencing outcome. We saw a trend toward significant difference in survival to discharge between those with single arrest versus those with multiple arrests. In our study, 23 patients (7.4%) had more than one arrest, with only 14 (4.8%) surviving to discharge [Table 2]. Although duration of CPR was a significant factor in this study in predicting survival after cardiac arrest, the ability to dictate a prescribed maximum duration of CPR remains questionable especially with regard to medical ethics. Absolute accuracy of time documentation is difficult with standard methods. Facial and tracheal deformities are other factors that may also influence outcomes.

A report from 115 studies showed a survival to discharge rate of 15.2% (USA 15%, Canada 16%, UK 17% other EU countries 14%). Some studies have found that resuscitation longer than 15 minutes was associated with significantly decreased survival to discharge. Duration of CPR of <10 minutes had a significant effect on survival in our study as calculated by multivariate analysis [Figure 1]. The average age in the previous study by Bialecki was 69 years, but the average age was (59.6 years) in our study. Our overall survival to discharge after CPR was 12%. Zoch et al. reported an overall survival to discharge after CPR of 32%, which was substantially higher than the rate of 17% found by Peberdy et al. These investigators speculated that increased use of “do not resuscitate” or “No Code” orders during the study period may have influenced the results. We do not use “do not resuscitate” order in our hospital.

**CONCLUSION**

This study provides a retrospective report of survival after in-hospital pulseless cardiac arrest. Our data and findings were generally similar to the results of others studies in the current literature. It seems prudent to have a baseline of data and to seek ways to improve the outcome of in-hospital CPR.

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