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Assessment of Cardiopulmonary Resuscitation Quality and Outcome Using the Modified Utstein Style Form: A Registry of in Hospital Cardiac Arrest Patients Admitted to Cairo University Hospitals

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Abstract

Background: The quality of cardiopulmonary resuscitation (CPR) performed according to the international guidelines is associated with improved survival in cardiac arrest (CA) survivors. The Utstein template (UT) has been used to objectively evaluate different variables of CPR quality and outcome.

Aim of Study: To evaluate adherence to CPR guidelines and investigate different variables affecting return of spontaneous circulation (ROSC) and survival to hospital discharge after in-hospital cardiac arrest (IHCA).

Patients and Methods: A Prospective observational study that included all patients admitted to three cardiac care units at Cardiovascular Departments Cairo University Hospitals who developed cardiac arrest and required cardiopulmonary resuscitation during the period from July 2018 to June 2019. Standard reporting of in-hospital CPR was done using a modified version of Utstein style form.

Results: The study included 3926 patients admitted to three cardiac care units at Cardiovascular Department Cairo University Hospitals from July 2018 to June 2019. The mean age of the studied patients was 55.6 ± 14.1 years. There were 2376 males (60.5%) and 1550 females (39.5%).

Out of 3926, 213 patients (5.4%) had in hospital cardiac arrest. Coronary artery disease (CAD) was the leading cardiac cause of admission in 1449 patients (36.9%), followed by congestive heart failure (CHF)/cardiogenic shock in 966 patients (24.6%).

Cerebrovascular accidents was the leading non-cardiac cause of admissionin 132 patients (3.4%), followed by infectious diseases (such as pneumonia, meningitis, etc.) in 89 patients (2.3%), shock (non cardiogenic) in 87 patients (2.2%), other medical diseases in 204 patients (5.2%) and surgical diseases in 41 patients (1%).

The main cause of cardiac arrest was congestive heart failure/cardiogenic shock found in 103 patients (48.4%). Cardiopulmonary resuscitation (CPR) was attempted in 211 patients. The initial rhythm was shockable in 33 patients (15.5%) and non shockable in 180 patients (84.5%). ROSC was achieved in 110 patients (52.1%) and survival to hospital discharge was achieved in 27 patients (12.8%).

Conclusion: Among the admitted patients 5.4% had cardiac arrest. Resuscitation was attempted in 99.1%. The mean duration of CPR in our study was 21 ± 12.2 minutes. Initially shockable rhythm showed higher rates of return of spontaneous circulation (ROSC) and survival to hospital discharge (69.7% and 36.4% respectively) when compared to non shockable rhythms (48.3% and 8.3% respectively). Return of spontaneous circulation was achieved in 52.1% of patients and the overall survival to hospital discharge was achieved in 12.8% of resuscitated patients. None of them had neurological deficit upon discharge.

Key Words: *Cardiopulmonary resuscitation – Return of spontaneous circulation – Utstein style.*

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Introduction

CARDIOVASCULAR disease (CVD) is the leading global cause of death, accounting for more than 17.9 million deaths per year according to 2015 statistics. This number is expected to grow to more than 23.6 million by 2030 **[1]**.

In 1990 ischemic heart disease and stroke were the second and fourth common causes of death but in 2010 they shifted to be the first and second cause respectively **[2]**.

It was found that despite advances in the treatment of heart disease, the outcome of patients who survived cardiac arrest (CA) remains poor **[3]**.

Although some aspects of acute resuscitation have improved over time these positive trends have been off-set by adverse trends in clinical features of patients presenting with CA (such as increasing age and decreasing proportion presenting with ventricular fibrillation). It was found that a well performed CPR has been shown to have a positive impact on survival **[4-6]**.

Compression depth range of 5-6cm in adults leads to better outcomes than all other compression depths during manual CPR [4]. Two studies found higher survival among patients who received chest compressions at a rate of 100-120min [5].

A meta-analysis of 51 in-hospital cardiac arrest (IHCA) studies showed a survival to hospital discharge between 13.4% and 14.6% [7].

To facilitate reporting of the different 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 [8].

The strength of the chain of survival is the strongest predictor of survival for victims of cardiac arrest [9] (Fig. 1).

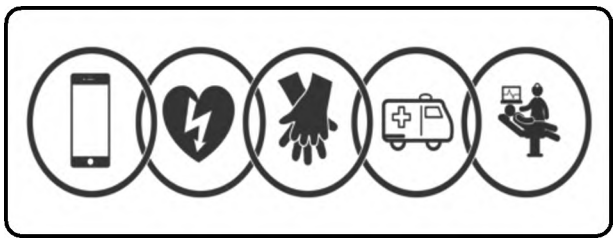


Fig. (1): System-specific chains of survival in-hospital cardiac arrest [9].

It was recommended that early steps of checking response, opening the airway, checking for breathing and calling the emergency medical dispatcher may be done simultaneously or in rapid succession [10].

The interventions that contribute to improved survival after cardiac arrest are rapid and effective bystander basic life support, uninterrupted high-quality chest compressions and early defibrillation for VF/pulse less VT. The use of adrenaline later during CPR has been shown to increase ROSC but not survival to discharge [6,11,12-15].

Successful return of spontaneous circulation (ROSC) is the first step towards the goal of complete recovery from cardiac arrest. The complex processes that occur following body ischemia during cardiac arrest and the subsequent reperfusion response during CPR defined the post-cardiac arrest syndrome [16].

Post cardiac arrest brain injury may be caused by microcirculatory failure, impaired auto regulation, hypotension, hypercarbia, hypoxemia, pyrexia, hypoglycemia, hyperglycemia and seizures. Moreover, myocardial dysfunction is common after cardiac arrest [17].

The importance of adherence to the Advanced Cardiovascular Life Support (ACLS) protocol was highlighted. Deviations from the algorithm was associated with decreased rates of ROSC and survival to discharge [18].

The objectives of this study were to evaluate the CPR outcomes of in-hospital cardiac arrest, check the degree of adherence to CPR guidelines, study the mode of cardiac arrest and its relation to the underlying etiology, investigate different variables affecting the return of spontaneous circulation (ROSC) and survival to hospital discharge after IHCA.

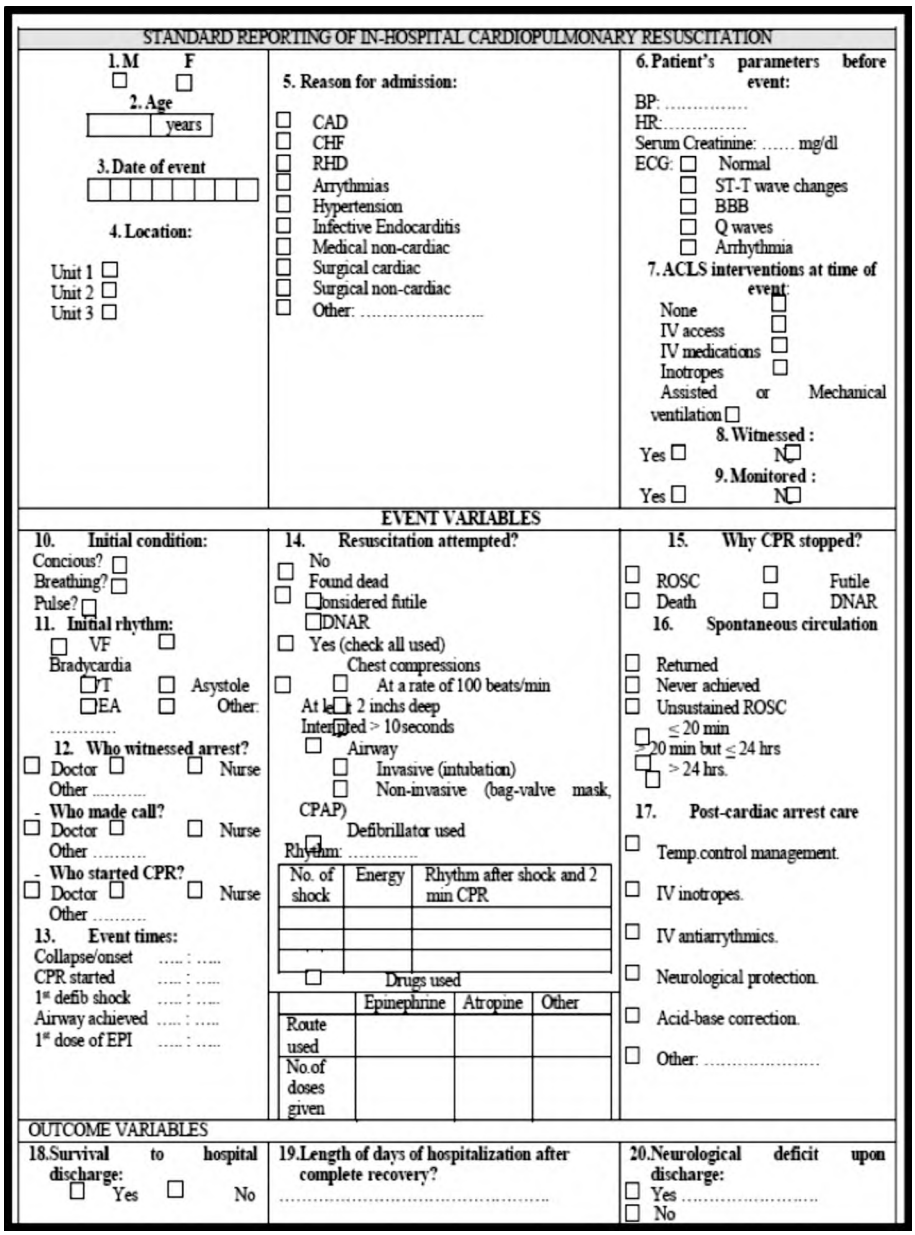
Patients and Methods

The study enrolled patients admitted to three cardiac care units at Cardiovascular Department Cairo University Hospitals who developed cardiac arrest and required cardio-pulmonary resuscitation during the period from July 2018 to June 2019. The study protocol was approved by the ethics committee of the Faculty of Medicine, Cairo University.

It was a prospective observational study of in-hospital cardiac arrest patients. On recognition of CA, the code blue team was activated and immediately initiated basic and advanced life support measures. All measures were attempted to strengthen the links of the chain of survival which included early recognition, early activation of the emergency response system, immediate high-quality CPR, rapid defibrillation, advanced live support Advanced Cardiac Life Support (ACLS) and post-arrest care access.

This study included all patients above 18 years old who sustained an IHCA admitted to the three cardiac care units at Cardiovascular Department Cairo University Hospitals. Standard reporting of in-hospital CPR was done using a modified version of Utstein style form [8] (Fig. 2).

Modified version of Utstein style form included patient variables (age, gender, location, reason for admission, witnessed and/or monitored cardiac arrest), event variables (initial rhythm, initial condition, chest compressions, ventilation, drugs used, and defibrillation) and outcome variables (survival to hospital discharge, days of hospitalization after return of spontaneous circulation, neurological deficit upon discharge from hospital and cause of death).



STANDARD REPORTING OF IN-HOSPITAL CARDIOPULMONARY RESUSCITATION

1. M ☐ F ☐

2. Age ____ years

3. Date of event ☐☐☐☐☐☐☐☐

4. Location:
Unit 1 ☐
Unit 2 ☐
Unit 3 ☐

5. Reason for admission:
☐ CAD
☐ CHF
☐ RHD
☐ Arrythmias
☐ Hypertension
☐ Infective Endocarditis
☐ Medical non-cardiac
☐ Surgical cardiac
☐ Surgical non-cardiac
☐ Other: ……

6. Patient's parameters before event:
BP: ……
HR: ……
Serum Creatinine: …… mg/dl
ECG: ☐ Normal
☐ ST-T wave changes
☐ BBB
☐ Q waves
☐ Arrhythmia

7. ACLS interventions at time of event:
None ☐
IV access ☐
IV medications ☐
Inotropes ☐
Assisted or Mechanical ventilation ☐

8. Witnessed :
Yes ☐ No ☐

9. Monitored :
Yes ☐ No ☐

EVENT VARIABLES

10. Initial condition:
Concious? ☐
Breathing? ☐
Pulse? ☐

11. Initial rhythm:
☐ VF ☐ Bradycardia
☐ VT ☐ Asystole
☐ EA ☐ Other: ……

12. Who witnessed arrest?
☐ Doctor ☐ Nurse
Other ……
Who made call?
☐ Doctor ☐ Nurse
Other ……
Who started CPR?
☐ Doctor ☐ Nurse
Other ……

13. Event times:
Collapse/onset ….. : …..
CPR started ….. : …..
1st defib shock ….. : …..
Airway achieved ….. : …..
1st dose of EPI ….. : …..

14. Resuscitation attempted?
☐ No
☐ Found dead
☐ Considered futile
☐ DNAR
☐ Yes (check all used)
Chest compressions
☐ At a rate of 100 beats/min
At least 2 inchs deep
Interrupted > 10 seconds
☐ Airway
☐ Invasive (intubation)
☐ Non-invasive (bag-valve mask, CPAP)
☐ Defibrillator used
Rhythm: ……

No. of shock	Energy	Rhythm after shock and 2 min CPR

☐ Drugs used

	Epinephrine	Atropine	Other
Route used			
No.of doses given			

15. Why CPR stopped?
☐ ROSC ☐ Futile
☐ Death ☐ DNAR

16. Spontaneous circulation
☐ Returned
☐ Never achieved
☐ Unsustained ROSC
☐ ≤ 20 min
☐ > 20 min but ≤ 24 hrs
☐ > 24 hrs.

17. Post-cardiac arrest care
☐ Temp.control management.
☐ IV inotropes.
☐ IV antiarrythmics.
☐ Neurological protection.
☐ Acid-base correction.
☐ Other: ……

OUTCOME VARIABLES

18. Survival to hospital discharge:
☐ Yes ☐ No

19. Length of days of hospitalization after complete recovery?
……

20. Neurological deficit upon discharge:
☐ Yes ……
☐ No

Fig. (2): The data collection form used in standard reporting of in-hospital cardiopulmonary resuscitation.

M: Male, F: Female, CAD: Coronary artery disease, RHD: Rheumatic heart disease, CHF: Congestive heart failure, ECG: Electrocardiogram, BBB: Bundle branch block, IV: Intravenous, VT: Ventricular tachycardia, VF: Ventricular fibrillation, PEA: Pulseless electrical activity, CPR: cardiopulmonary resuscitation, EPI: Epinephrine, DNAR: Do not attempt resuscitation, ROSC: Return of spontaneous circulation **[8]**.

Primary endpoint was defined as CPR outcome with survival to hospital discharge and neurological recovery after resuscitation. Secondary endpoints included ROSC and adherence to CPR guidelines.

Post-cardiac arrest care included all the steps taken once ROSC was achieved in an attempt to counteract the post-resuscitation syndrome (intravenous inotropes, antiarrhythmic drugs in recurrent VT and percutaneous interventionor thrombolytic therapy for ST elevation acute myocardial infarction). Duration of hospitalization post-ROSC and survival to hospital discharge were recorded.

Statistical analysis:

Data were collected, revised, coded and entered to the statistical package for social science (SPSS) version 24 (SPSS Inc, Chicago, IL, 2001).

Qualitative data were presented as numbers and percentages while quantitative data were presented as mean, standard deviations and ranges. The comparison between groups as regards qualitative data was done by using Chi-square test.

The comparison between groups with quantitative data and normal distribution was done by using

independent *t*-test. One way ANOVA was used when comparing between more than two groups with quantitative data and normal distribution.

Receiver operator characteristic (ROC) analysis was used to determine the optimum cut off value for duration of CPR in predicting ROSC.

Multivariate logistic regression analysis was used to assess the significant predictors of mortality and ROSC.

The confidence interval was set to 95% and the margin of error was set to 5%, the *p*-value was considered highly significant if <0.01.

Results

The study included 3926 patients admitted to three Cardiac Care Units at Cardiovascular Department Cairo University Hospitals from July 2018 to June 2019 .The mean age of the studied patients was 55.6± 14.1 years. There were 2376 males (60.5%) and 1550 females (39.5%).

Out of 3926, 213 patients (5.4%) had in hospital cardiac arrest. The mean age of the arrested patients was 57.2±15.9 years, (*p*-value = <0.001). Moreover, 139 patients (65.3%) were males.

Coronary artery disease (CAD) was the leading cardiac cause of admission in 1449 patients (36.9%), followed by congestive heart failure (CHF)/cardiogenic shock in 966 patients (24.6%), arrhythmia (such as atrial fibrillation, ventricular tachycardia, etc.) in 354 patients (9%), infective endocarditis in 263 patients (6.7%), hypertensive crisis in 94 patients (2.4%), deep venous thrombosis /pulmonary embolism in 55 patients (1.4%) and atrioventricular block in 67 patients (1.7%).

Cerebrovascular accidents was the leading non-cardiac cause of admission in 132 patients (3.4%), followed by infectious diseases (such as pneumonia, meningitis, etc.) in 89 patients (2.3%), shock (non cardiogenic) in 87 patients (2.2%), other medical diseases in 204 patients (5.2%) and surgical diseases in 41 patients (1%).

A hundred and ten patients (51.6%) had normal baseline electrocardiogram before the event, while 35 patients (16.5%) had ST-T wave changes, 31 patients (14.6%) had arrhythmia (e.g. atrial fibrillation, atrial flutter, etc.), 22 patients (10.3%) had bundle branch block, and 15 patients (7%) had pathological Q waves.

Out of 213 patients, 104 patients (48.8%) received in otropes/vaso-active drugs before event, with no statistically significant difference between the three units (*p*-value=0.91). Moreover, mechanical ventilation was used in 89 patients (41.8%) with no statistically significant difference between the three units (*p*-value=0.56).

Resuscitation was attempted in 211 patients (99.1%), while no resuscitation was attempted in the remaining 2 patients (0.9%) as medical care was considered futile. In our study, 174 arrested patients (82.5%) were witnessed by the physician, while 37 (17.5%) were witnessed by the nurse.

The nurse started CPR in 29 cases (78.4%) out of the 37 cardiac arrest witnessed by nurse, which indicated intermediate degree of first responder CPR by nurses. The most commonly recorded initial rhythm was brady- as ystole in 163 patients (76.5%), followed by ventricular fibrillation (VF) in 24 patients (11.3%), pulseless electrical activity (PEA) in 17 patients (8%) and pulseless ventricular tachycardia (VT) in 9 patients (4.2%).

Chest compressions were effective in 91 (43.1 %) out of 211 resuscitated patients. Invasive airway securing was used in 57.4% of the resuscitated patients; non invasive airway was used in 1.4% of resuscitated patients due to failure of intubation, while 41.2% of the resuscitated patients-were already intubated.

Defibrillator was used in 45 cases (21.3%) of attempted resuscitations. Out of 45 patients, 33 patients had an initial shock able rhythm with the remaining 12 patients requiring defibrillation later during the course period of the arrest and not for an initial shockable rhythm. Energy levels ranged between 150 and 250 Joules with a mean of 205.9 ±34.4 Joules.

The main medications used during cardiac arrest were epinephrine (used in 100% of resuscitated patients) and atropine (used in 69.2% of resuscitated patients). The mean dose of atropine used in our study was 1.3±0.5mg, and it was given to 69.2% of the resuscitated patients. Other drugs used were sodium bicarbonate, potassium, calcium gluconate, magnesium, amiodarone, lidocaine, and glucose-insulin. All drugs were used intravenously.

Spontaneous circulation was achieved and sustained in 27 patients (12.8%), un-sustained in 83 patients (39.3%) and never achieved in 101 patients (47.9%).

The mean CPR duration was 21 ± 12.2 minutes. The optimum cut off value for CPR duration in predicting return of spontaneous circulation (ROSC) was noted to be 19 minutes (Fig. 3).

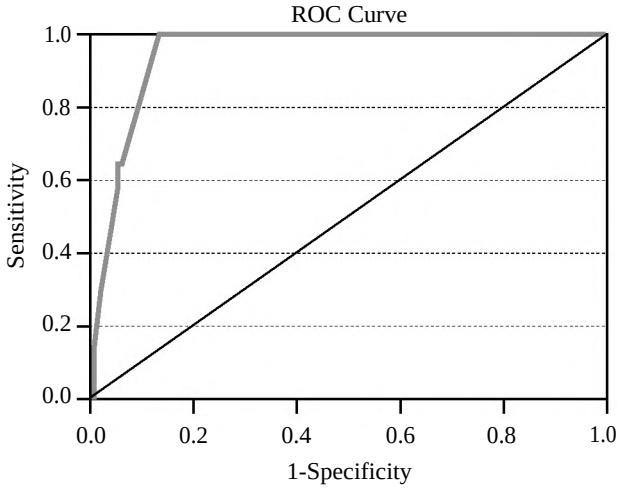


Fig. (3): A receiver operating characteristic curve for determining cut off value for duration of cardiopulmonary resuscitation in predicting return of spontaneous circulation.

However, the optimum cut off value for CPR duration in predicting survival to hospital discharge was noted to be 9.5 minutes (Fig. 4).

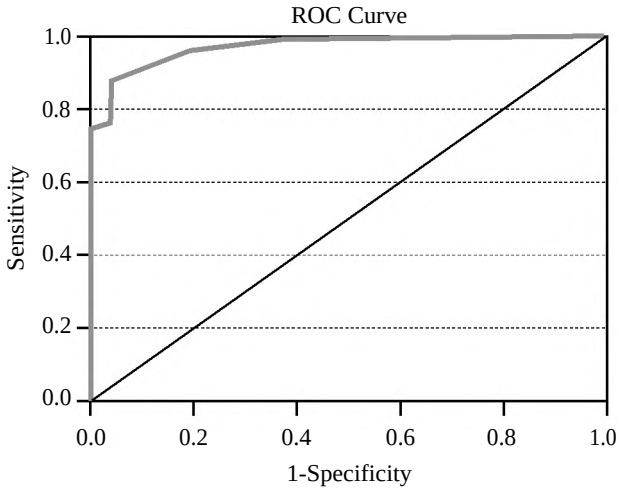


Fig. (4): A receiver operating characteristic curve for determining cut off value for duration of cardiopulmonary resuscitation in predicting survival to hospital discharge.

The mean time interval from collapse to CPR was (1.03±0.18) minutes. The major reason for CPR termination was death declared in 101 patients (47.9%), followed by return of spontaneous circulation (ROSC), which was achieved in 110 patients (52.1%).

Patients who achieved ROSC (whether sustained or un-sustained) received post cardiac arrest care in the form of intravenous inotropes, antiarrhythmic drugs, acid base correction, mechanical ventilation, electrolyte imbalance correction and percutaneous coronary interventions for acute coronary syndromes. The rapeutic hypothermia was not available in any of the three units duetolack of needed equipment. Survival to hospital discharge was achieved in 27 patients (12.8%) out of 211 resuscitated patients. None of the survivors had neurological deficit upon discharge.

The mean doses of epinephrine used were 7.6±4, 8.2±4 and 6.9±3.4mg in the three cardiac care units with p-value 0.016. The mean dose of epinephrineinour study was 7.6±3.8mg. The mean dose of epinephrine was a statistically significant predictor of ROSC. The two patients who did not receive a resuscitation attempt were excluded from this analysis. (Table 1).

Univariable predictors of survival to hospitald is charge were heart rate (with a mean of 92.2 ± 14.8bpm), an initially shock able rhythm, time interval from collapse to starting the cardio pulmonary resuscitation and mean dose of epinephrine. (Table 2).

Table (1): Univariable predictors of return of spontaneous circulation (ROSC).

	Death		ROSC		p-value
Gender:					
Male	61	60.4%	77	70.0%	0.093
Female	40	39.6%	33	30.0%	
Age (years mean ± SD)	60.4	15.9	54.1	15.3	0.004
HR before event (beat/min) mean ± SD	105.0	20.2	98.3	22.1	0.023
Who witnessed arrest:					
Doctor	79	78.2%	95	86.4%	0.085
Nurse	22	21.8%	15	13.6%	
Initial rhythm:					
Brady asystole	85	84.2%	76	69.1%	0.036
PEA	6	5.9%	11	10.0%	
VF	9	8.9%	15	13.6%	
VT	1	1.0%	8	7.3 %	
Time interval from collapse to CPR start (minutes) mean ± SD	1.0	0.2	1.0	0.2	0.62
Time interval from collapse to 1 st dose of epinephrine (minutes) mean ± SD	2.0	0.8	2.0	0.7	0.69
Time interval from collapse to 1 st defibrillator shock (minutes) mean ± SD	3.8	2.5	3.0	1.9	0.23
Time interval from collapse to airway securing (min) mean ± SD	2.9	1.2	2.7	1.3	0.48
Does of epinephrine (mg) mean ± SD	10.2	2.3	4.8	2.8	<0.001

SD : Standard deviation.
HR : Heart rate.
VT : Ventricular Tachycardia.
VF : Ventricular fibrillation.
PEA : Pulseless electrical activity.
CPR : Cardiopulmonary resuscitation.
ROSC : Return of spontaneous circulation.

Table (2): Univariable predictors of survival to hospital discharge.

	Death		Survival		*p*-value
Gender:					
Male	121	65.1%	18	66.7%	0.53
Female	65	34.9%	9	33.3%	
Age (years)	58.0	16.5	52.5	9.9	0.093
HR before event (beat/min)	103.2	22.1	92.2	14.8	0.02
Who witnessed arrest:					
Doctor	149	81.0%	25	92.6%	0.12
Nurse	35	19.0%	2	7.4%	
Initial rhythm:					
Brady asystole	153	82.3%	10	37.0%	<0.001
PEA	12	6.5%	5	18.5%	
VF	17	9.1%	7	25.9%	
VT	4	2.2%	5	18.5%	
Time interval from collapse to CPR start (minutes)	1.0	0.2	1.0	0.0	0.008
Time interval from collapse to 1st dose of epinephrine (minutes)	2.0	0.7	2.0	0.8	0.63
Time interval from collapse to 1st defibrillator shock (minutes)	3.8	2.4	2.2	0.4	0.002
Time interval from collapse to airway securing (min)	2.8	1.3	2.5	0.9	0.94
Does of epinephrine (mg) mean ± SD	8.1	3.4	2.5	0.8	<0.001

SD : Standard deviation.
HR : Heart rate.
VT : Ventricular Tachycardia.
VF : Ventricular fibrillation.
PEA : Pulseless electrical activity.
CPR : Cardiopulmonary resuscitation.

Discussion

In-hospital cardio pulmonary arrest is an emergency situation that requires team-work and an appropriate rapid sequential action to rescue patients. By doing a survey on in-hospital cardiac arrest we could determine the weak points in the chain of survival and accordingly strengthen them.

Our study was a prospective observational study which included 213 cardiac arrests among 3926 patients admitted to three cardiac care units at Cardiovascular Departments Cairo University Hospitals.

Concordant with previous studies **[7,19]**, the mean age of our patients was 57.2 ± 15.9 years; and males were more prevalent (65.3%). The leading cardiac causes of admission among the arrested patients in our study were CHF and/or cardiogenic shock found in 103 (48.4%), followed by ACS in 36 (16.9%) and infective endocarditis in 26 (12.2%). The leading non cardiac cause of admission was non-cardiogenic shock in 15 (7.1%), followed by CVA in 6 (2.8%).

These findings were discordant with another study **[20]** which found that the leading cardiac cause of admission was ACS in 39% of patients followed by CHF in 8% of patients and the main non cardiac cause of admission was sepsis in 5% of patients followed by CVA in 2% of patients.

We found that systemic hypertension was the main comorbidity among the arrested patients (58.7%), followed by renal impairment (52.6%), diabetes mellitus (52.6%), dyslipidemia (42.7%), and chronic obstructive pulmonary disease / bronchial asthma (36.6%).

Moreover, we found that 99.1 % of the arrested patients were monitored and witnessed, while 0.9% were neither monitored nor witnessed which was higher than what was previously reported by Matthew et al., **[21]** who found that 87.6% of patients were monitored and 83.3% of patients were witnessed.

Concordant with Khan et al., **[22]**, the main initial recorded rhythm in our study was non shockable rhythm in 84.5% of the patients (bradyasystole and PEA 76.5% and 8% respectively), followed by shockable rhythm (15.5%). The quality of chest compressions was excellent in all patients with appropriate depth (5-6cm), rate (100-120 compressions/min) and 100% adherence to guidelines. Concordant with Khan et al., **[22]** invasive airway securing was used in 57.4% of the resuscitated patients.

Andrews et al., **[23]** identified barriers to automated external defibrillators use by nurses and respiratory therapists and found that 87.5% performed CPR and 29.2% defibrillated a patient. In the current study defibrillator was used in 45 cases (21.3%) of attempted resuscitations. Defibrillators were used in all shock able rhythm with 100% adherence to ILCOR guidelines.

Out of 45 patients, 33 patients had an initial shock able rhythm with the remaining 12 patients requiring defibrillation were shocked later during the course period of the arrest and not for an initial shock able rhythm.

In our study, 174 arrested patients (82.5%) were witnessed by the physician, while 37 (17.5%) were witnessed by the nurse. A previous study conducted by Taha et al., in 2015 **[7]** found that nurses started CPR in 19.2% only of cases, while the current study found that nurses started CPR in 78.4% of the cardiac arrest which indicated an improvement in first responder CPR by nurses and pointed out to the success of frequently held basic life support

training programs at the Cardiovascular Department at Cairo University hospitals in improving performance during cardiac arrest.

Epinephrine was used in 100% of our patient. The median interval between epinephrine doses was 3.6 minutes. The mean dose of epinephrine used was 7.6±3.8mg.

The mean time interval from collapse to CPR, from collapse to first dose of epinephrine, from collapse to first defibrillation shock and from collapse to securing airway was 1.03±0.17, 2.02 ±0.7, 3.3±2.15 and 2.7±1.2 minutes respectively.

A study done by Duran et al., **[24]** revealed that alert arrival, arrival to CPR initiation, arrival to first defibrillation, arrival to intubation and arrival to first adrenaline took 1.23±0.95, 0.63±0.38, 2.06 ±1.33, 8.42±4.6 and 3.3±1.9 minutes respectively.

Many studies addressed the effect of adrenaline on the neurological outcome. Dumas et al., **[11]** in his large cohort of patients who achieved ROSC found that pre-hospital use of epinephrine was associated with a lower chance of survival, an association that showed a dose effect and persisted despite post-resuscitation interventions.

Moreover, Nakahara et al., **[12]** concluded that pre-hospital administration of adrenaline by emergency medical services improved the long term outcome in patients with out of hospital cardiac arrest, although the absolute increase of neurologically intact survival was minimal.

Olasveengen et al., **[13]** found that receiving adrenaline was associated with improved short-term survival, but decreased survival to hospital discharge and survival with favorable neurological outcome after out-of-hospital cardiac arrest.

Hagihara et al., **[14]** found that in patients with out-of-hospital cardiac arrest in Japan, the use of prehospital epinephrine was significantly associated with increased chance of return of spontaneous circulation before hospital arrival but decreased chance of survival and good functional outcomes 1 month after the event.

Concordant with other studies **[7,25,26]** ROSC was achieved in 52.1% of patients. The mean duration of CPR in our study was 21.05±12.2 minutes. A previously conducted study by Taha et al., **[7]** at Cairo University Hospitals found that ROSC was achieved in 50.4% of cases Moreover, the same study found that a cut-off value for CPR duration of 22.5min in predicting ROSC. However, survival to discharge was achieved in only 7.6% of 119 attempted resuscitations compared to the current study that revealed survival to hospital discharge in 12.8% of resuscitated patients and none of them had neurological deficit upon discharge indicative of improved outcome and quality of CPR at our department over the past years.

Similar to our study, Pereira et al., **[27]** found that out of the 41 sudden cardiac arrested patients 23 patients (56.1%) had a sustained ROSC for more than 20 minutes.

Other studies reported higher percentage of survival to hospital discharge **[28,29]** which may be attributed to medical-cultural differences in do-not-resuscitate orders (DNR), differences in patient categories with higher probabilities of ROSC and different practices in post-cardiac arrest care that may influence the survival to hospital discharge.

In the present study initially shockable rhythm showed higher rates of ROSC and survival to hospital discharge (69.7% and 36.4% respectively) when compared to non shockable rhythms (48.3% and 8.3% respectively). This was close to the study conducted by Taha et al., **[7]** where ROSC and survival to hospital discharge were achieved in 68.4% and 31.6% respectively in patients with initially shockable rhythm.

However Khan et al., **[22]** found that non shockable rhythms were associated with higher rates of ROSC (76%) compared to shockable rhythms (24%).

Conclusion:

The current study found that the main underlying etiology among the arrested patients was congestive heart failure and cardiogenic shock. ROSC was achieved in (52.1%) of the resuscitated patients. Overall survival to hospital discharge was achieved in 12.8% of resuscitated patients and none of them had neurological deficit upon discharge. The nurses at Cardiovascular Units Cairo University hospitals started CPR in 78.4% which was a significant improvement than previously reported probably attributed to active participation in basic life support training programs held regularly at the Cardiovascular Department Cairo University Hospitals.

Recommendations:

Hospitals should strongly encourage all personnel to follow the latest CPR guidelines and engage in basic life support programs. Development of DNAR policy may ensure rapid and appropriate CPR initiation to indicated patients only. A need exists to improve our post-cardiac arrest care

including targeted temperature management and neuro protective therapy.

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Conflict of interest: None declared.

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تقييم جودة الإنعاش القلبى الرئوى ونتائجه باستخدام نموذج أسلوب Utstein المعدل سجل لمرضى السكتة القلبية بالمستشفى الذين تم قبولهم فى مستشفيات جامعة القاهرة

الخلفية : ترتبط جودة الإنعاش القلبى الرئوى الذى يتم إجراؤه وفقاً للإرشادات الدولية بتحسين البقاء على قيد الحياة فى حالة الناجين من السكتة القلبية. تم استخدام نموذج Utstein لتقييم المتغيرات المختلفة لجودة ونتائج الإنعاش القلبى الرئوى بشكل موضوعى.

الهدف من الدراسة : تقييم الالتزام بإرشادات الإنعاش القلبى الرئوى والتحقيق فى المتغيرات المختلفة التى تؤثر على عودة الدوة الدموية التلقائية والبقاء على قيد الحياة حتى الخروج من المستشفى بعد السكتة القلبية داخل المستشفى.

المرضى وطرق البحث : دراسة رصدية مستقبلية شملت جميع المرضى الذين تم قبو لهم فى ثلاث وحدات لرعاية القلب فى أقسام القلب والأوعية الدموية بمستشفيات جامعة القاهرة الذين أصيبوا بالسكتة القلبية وتطلبوا الإنعاش القلبى الرئوى خلال الفترة من يوليو ٢٠١٨ إلى يونيو ٢٠١٩. تم الإبلاغ القياسى عن الإنعاش القلبى الرئوى داخل المستشفى باستخدام تعديل معدل نسخة من شكل نمط Utstein.

النتائج :اشتملت الدراسة على مريضاً تم قبو لهم فى ثلاث وحدات لرعاية القلب فى مستشفيات جامعة القاهرة بقسم القلب والأوعية الدموية من يوليو ٢٠١٨ إلى يونيو ٢٠١٩، وكان متوسط عمر المرضى الخاضعين للدراسة ٥٥.٦±١٤.١ سنة. كان هناك ٢٣٧٦ ذكور (٦٠.٥٪) و ١٥٥٠ إناث (٣٩.٥٪). من بين ٣٩٢٦، كان مريضاً (٥.٤٪) مصابين بالسكتة القلبية بالمستشفى. كان مرض الشريان التاجى هو السبب الرئيسى لدخول مرضى القلب (٣٦.٩)، يليه فشل القلب الاحتقانى / الصدمة القلبية (٢٤.٦٪).

كانت الحوادث الوعائية الدماغية هى السبب الرئيسى غير القلبى لدخول ١٣٢ مريضاً (٣.٤٪)، تليها الأمراض المعدية (مثل الالتهاب الرئوى والتهاب السحايا وما إلى ذلك) فى ٨٩ مريضاً (٢.٣٪)، والصدمة (غير قلبية) فى ٨٧ مريضاً (٢.٢٪) وأمراض طبية أخرى فى ٢٠٤ مرضى (٥.٢٪) وأمراض جراحية فى ٤١ مريضاً (١٪).

كان السبب الرئيسى للسكتة القلبية هو قصور القلب الاحتقانى / الصدمة القلبية التى وجدت فى ١٠٣ مرضى (٤٨.٤٪). تمت محاولة الإنعاش القلبى الرئوى فى ٢١١ مريضاً. كان الإيقاع الأولى قابلاً للصدمات عند ٣٣ مريضاً (١٥.٥٪) وغير قابل للصدمات فى ١٨٠ مريضاً (٨٤.٥٪). تم تحقيق معدل تكرار الاستجابة السريعة فى ١١٠ مريضاً (٥٢.١٪) وتحقق البقاء على قيد الحياة حتى الخروج من المستشفى فى ٢٧ مريضاً (١٢.٨٪).

الاستنتاج : من بين المرضى الذين تم إدخالهم ٥.٤٪ أصيبوا بالسكتة القلبية. تمت محاولة الإنعاش فى ٩٩.١٪. كان متوسط مدة الإنعاش القلبى الرئوى فى دراستنا ٢١±١٢.٢ دقيقة. أظهر إيقاع الصدمات فى البداية معدلات أعلى لعودة الدورة الدموية التلقائية والبقاء على قيد الحياة إلى الخروج من المستشفى (٦٩.٧٪ و ٣٦.٤٪ على التوالى) عند مقارنته بالإيقاعات غير القابلة للصدمات (٤٨.٣٪ و ٨.٣٪ على التوالى)، وتحقق عودة الدورة التلقائية فى ٥٢.١٪ من المرضى والبقاء الكلى على قيد الحياة حتى الخروج من المستشفى تم تحقيقه فى ١٢.٨٪ من المرضى الذين تم إنعاشهم. لم يكن لدى أى منهم عجز عصبى عند الخروج.