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Risk Factors in Reducing Mortality from in-hospital Cardiopulmonary Resuscitation

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Abstract

***Introduction*:** In-hospital cardiac arrest is a common health problem associated with high levels of mortality, our goal is to identify the important elements that play a significant role in lowering cardiopulmonary resuscitation (CPR) in-hospital (code Blue) death rates. **Methods:** this was a retrospective cohort study, involving patients who had in-hospital CPR at Heraa General Hospital from January 2020 to June 2022. The data was collected from the hospital's information center. ***Results*:** our sample population was over 600 patients, selected randomly from the hospital's information center. Consist of 55.1% males and 44.5% of them were females with 53.9% having Pulseless Electrical Activity (PEA) as initial cardiac rhythm. The following variables: age, intubated before CPR, intubated during CPR, initial cardiac rhythm, Adrenaline 1mg, and Amiodarone 300mg showed P-valve less than 0.05. ***Conclusion*:** There is statistically significant association between the clinical variables: Intubated before CPR, intubated during CPR, initial cardiac rhythm, Adrenaline 1mg, Amiodarone 300mg and age and "Survived after Cardiopulmonary resuscitation (CPR)".

Keywords: cardiac arrest, cardiopulmonary resuscitation (CPR), Pulseless Electrical Activity (PEA), CPR.

INTRODUCTION

Using a sample of Saudi Arabians, this study will examine cardiopulmonary resuscitation rates, fatalities preceded by CPR, and survival trends after in-hospital CPR. The rates will be examined throughout a three-year period in the research.

Cardiopulmonary resuscitation is an emergency treatment that combines chest compressions with artificial ventilation to sustain brain function until further steps are taken to restore spontaneous blood circulation and airway breathing in cardiac arrested patients [1].

A cardiac arrest claims the lives of 475,000 Americans annually [1]. Because the cause of arrest is frequently advanced chronic disease rather than a readily reversible acute cardio-pulmonary incident, CPR for hospitalized patients is linked with poor results [2]. When discussing CPR with patients, doctors can estimate that 15% of patients who get CPR in the hospital will live to discharge. Specific co-morbidities, on the other hand, diminish the chances of survival, and survivors are at risk for a variety of CPR-related problems [3].

Consequently, this study is mainly proposed to target men and women, code blue cases, with cardiac arrest, respiratory issues, or experiences any other

medical emergency. Taking into consideration the biases of gender; after a sudden cardiac arrest, 45 percent of males got CPR in public, compared to 39 percent of women [4]. Men are 1.23 times more likely than women to get bystander aid, and their odds of survival are 23% greater [3]. This study's focused assessment will estimate the annual incidence of CPR per 1000 admissions in Heraa General Hospital from various age groups, Heraa General Hospital deaths preceded by CPR, and survival rates after in-hospital CPR [5].

As determined to figure out the key factors that affects the mortality rates, whether decreased or increases, of the cases administered, the factors that this study will decide on it will be as follows: Age, gender, weight, height, how many days admitted under Intensive Care Unit (ICU), type of arrest, was the event witnessed or not, was the patient intubated before CPR or during the CPR, what is the initial cardiac rhythm in the electrocardiogram (ECG), how many medication of the following were used: Atropine sulfate 1mg, Adrenaline 1mg, NaHCO3 8.4%, Calcium Gluconate 10%, Amiodarone 300mg, and Lidocaine, and duration of CPR.

METHODOLOGY

Data on administrated patients will be gathered from Heraa General Hospital's Information Center for the period of January 2020 to June 2022. By comparing estimations based on sample data with the full population, the representativeness and validity of this sample database will be validated. The patient's unique encrypted medical record number (MRN), age, gender, weight, height, days in ICU, primary diagnosis, secondary diagnosis, date, arrest time, area of arrest, type of arrest, intubated before, intubated during, initial cardiac rhythm, medication used during CPR, time started, time ended, duration of CPR, and survived or not will be obtained.

Statistical Analysis

Logistic regression analysis will be used to examine the relationships between survival and patient and hospital factors. Multivariable models will contain variables with a statistically significant correlation (estimated to be P.05). As predicted, the connection would be declared statistically significant at P.05. The regression test is used to examine annual trends in hospitalization length. SPSS 2019 we be used for the statistical analysis.

RESULTS

Table *1* and Figure *1* represent the distribution of patients, according to socio-demographic (Gender) studied patients' highest percentage was Male 55.1 %. Only 44.5% of them were Female.

Table 1: Frequency analysis of gender variable

Gender (M/F)			
		Frequency	**Percent**
Valid	Male	348	55.1
	Female	281	44.5
	Other	3	0.5
	Total	632	100.0

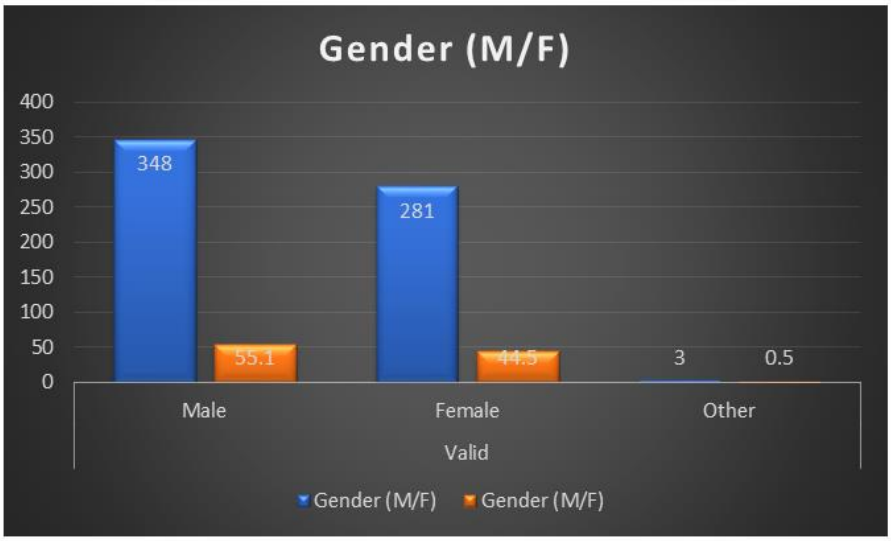

Figure *1*

Table *2* and Figure *2* represent the distribution of patients, according to Initial cardiac rhythm, studied patients highest percentage was Pulseless Electrical Activity 53.9%. Only 0.3% of them were Sinus Rhythm.

Table 2: Frequency analysis of initial cardiac rhythm variable

Initial Cardiac Rhythm			
		Frequency	Valid Percent
Valid	Asystole	157	25.4
	Bradycardia	113	18.3
	Pulseless Electrical Activity	333	53.9
	Ventricular Fibrillation	8	1.3
	Ventricular Tachycardia	5	0.8
	Sinus Rhythm	2	0.3
	Total	618	100.0

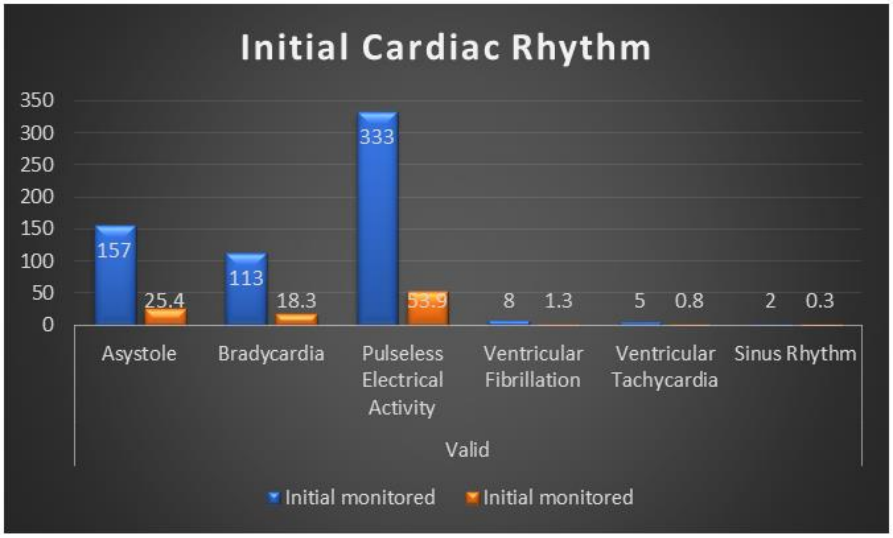

Figure *2*

Table 3 and Figure 3 represent the frequency and distribution of Survived (yes/no)*Cardiac/Respiratory Arrest, where the percent of patients who Survived after Cardiopulmonary resuscitation and Cardiac Arrest 77.3%, Respiratory Arrest 10%, Cardiac and Respiratory Arrest 12.7%, while the percent of patients who non Survived after Cardiopulmonary resuscitation and Cardiac Arrest 81.6%, Respiratory Arrest 4%, Cardiac and Respiratory Arrest 14.4%, there are significant relationship between Survived after Cardiopulmonary resuscitation and Cardiac/ Respiratory Arrest where Chi-Square Tests sig =0.02 is less than 0.01; hence, we can say that there significant weak relationship between Survived after Cardiopulmonary resuscitation and Cardiac/ Respiratory Arrest where Contingency Coefficient is 0.124.

Table 3: Cross-tabulation analysis between survived variable and cardiac/respiratory arrest variable

Survived (yes/no) * Cardiac/Respiratory Arrest Cross-tabulation						
			Cardiac/ Respiratory Arrest			Total
			Cardiac Arrest	Respiratory Arrest	Cardiac and Respiratory Arrest	
Survived (yes/no)	Yes	Count	140	18	23	181
		% within Survived (yes/no)	77.3%	10%	12.7%	100%
	No	Count	368	18	65	451
		% within Survived (yes/no)	81.6%	4.0%	14.4%	100%
Total		Count	508	36	88	632
		% within Survived (yes/no)	80.4%	5.7%	13.9%	100%
Chi-Square Tests			0.020			
Contingency Coefficient			0.124			

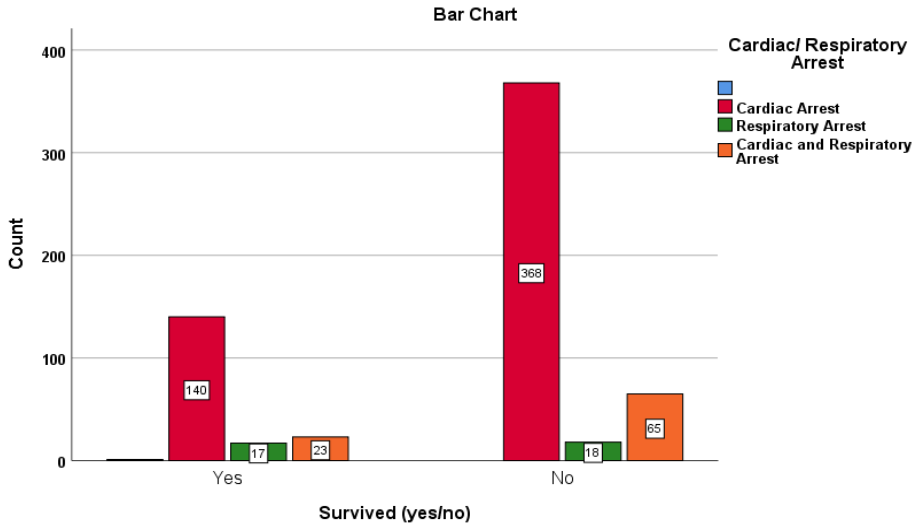

Figure *3*

Table 4 represents the multiple regression analysis and dependent variable as Survived after Cardiopulmonary resuscitation. R-square value denotes that 57% of variations of Survived explained by the clinical variables.

Table 4: Multiple regression analysis and dependent variable as survived after cardiopulmonary resuscitation

S. no.	Model	Unstandardized coefficients		Wald	df	Sig.	Exp(B)	Nagelkerke R Square
		B	Std. error					
1	Gender	-0.089	0.262	0.116	1	0.733	0.915	0.57
2	Age	0.019	0.008	4.887	1	0.027	1.019	
3	Height	-0.007	0.007	0.853	1	0.356	0.993	
4	Weight	0.000	0.008	0.002	1	0.966	1.000	
5	Days in ICU	0.022	0.015	2.143	1	0.143	1.022	
7	Cardiac/ Respiratory Arrest	0.219	0.409	0.287	1	0.592	1.245	
9	Witnessed	0.318	0.603	0.279	1	0.597	1.375	
10	Intubated before	-1.020	0.392	6.772	1	0.009	0.361	
11	Intubated during CPR	1.247	0.342	13.332	1	0.000	3.481	
12	Initial cardiac rhythm	-0.749	0.189	15.767	1	0.000	0.473	
13	How many Atropines Sulfate 1mg	-0.146	0.210	0.486	1	0.486	0.864	
14	How many Adrenaline 1mg	0.204	0.098	4.293	1	0.038	1.226	
15	How many NaHCO3 8.4%	-0.114	0.150	0.584	1	0.445	0.892	
16	How many Calcium Gluconate 10%	-0.169	0.205	0.675	1	0.411	0.845	
17	How many Amiodarone 300mg	-1.742	0.794	4.810	1	0.028	0.175	
18	How many Lidocaine	-0.939	1.301	0.521	1	0.470	0.391	
19	Duration	0.238	0.036	44.416	1	0.000	1.268	
20	Constant	-2.363	1.360	3.020	1	0.082	0.094	

DISCUSSION

Jaureguibeitia (2021) found that Full-episode median errors below 2% in CCF, 1 min−1 in CCR, and 1.5% in interruption ratio, were measured for all signals and devices. The proportion of cases with large errors (10% in CCF and interruption ratio, and 10 min−1 in CCR) was below 10%. Errors were lower for shorter sub-intervals of interest, like the airway insertion interval, an automated methodology was validated to accurately compute CPR metrics in large and heterogeneous OHCA datasets. Automated processing of defibrillator files and the associated clinical annotations enables the aggregation and analysis of CPR data from multiple sources [6].

The P-values corresponding to the "Age" = 0.027 are less than 0.01; hence, we can say that the "Age" are highly impacting the "Survived after CPR" where the percent of patients who non-Survived after CPR more than the percent of patients who Survived after CPR by 0.92 according to "Age", In addition The P-values corresponding to the "Intubated before CPR" are less than 0.01; hence, we can say that the "Intubated before CPR" are highly impacting the "Survived after CPR", the percent of patients who "non-Survived after CPR" more than the percent of patients who "Survived after CPR" by 0.36 according to "Intubated before CPR".

The P-values corresponding to the "Intubated during CPR" are less than 0.01; hence, we can say that the "Intubated during CPR" are highly impacting the "Survived after CPR", the percent of patients who "non-Survived after CPR" more than the percent of patients who "Survived after CPR" by 0.35 according to "Intubated before CPR".

"Initial cardiac rhythm" is less than 0.05 and is significant at 5% level; hence, we can say that "initial cardiac rhythm" is highly impacting the "Survived after CPR", where the percent of patients who "non-Survived after CPR" more than the percent of patients who "Survived after CPR" by 0.47 according to "initial cardiac rhythm".

"Adrenaline 1mg" are less than 0.05 and is significant at 5% level; hence, we can say that "Adrenaline 1mg" are highly impacting the "Survived after CPR", where the percent of patients who "non-Survived after CPR" more than the percent of patients who "Survived after CPR" by 0.18 according to "Adrenaline 1mg".

"Amiodarone 300mg" are less than 0.05 and is significant at 5% level; hence, we can say that "Amiodarone 300mg" are highly impacting the "Survived after CPR", where the percent of patients who "non-Survived after CPR" more than the percent of patients who "Survived after CPR" by 1.3 according to "Amiodarone 300mg".

Association between most clinical variables and the Survived after CPR among patients with Cardiac/ Respiratory Arrest showed that "body mass index and total cholesterol level" are less than 0.01 and are highly significant at 1% level; hence, we can say that there is high significant association between the clinical variables: Intubated before and during CPR, Initial cardiac rhythm ,Adrenaline 1mg, Amiodarone 300mg, and age and "Survived after CPR", while Gender, Height , Weight, Days in ICU, Cardiac/Respiratory Arrest, Witnessed, Atropine Sulfate 1mg, NaHCO3 8.4%, Calcium Gluconate 10%, and Lidocaine are more than 0.05 and is non-significant at 5% level; hence, we can say that aren't impacting the "Survived after CPR".

Tortolani *et al*., they found that the in-hospital mortality rate was 100% when the patient was older than 68 years old, experienced cardiorespiratory arrest in the emergency room, was in asystole, when a defibrillator was used, had tracheal intubation, received multiple intravenous medications, or had more than one inotropic or vasopressor dropped. Mortality was 35.7% when the patient lacked any of those factors [7].

CONCLUSION

There is high significant association between the clinical variables: Intubated before CPR, intubated during CPR, Initial cardiac rhythm, Adrenaline 1mg, Amiodarone 300mg and age and "Survived after Cardiopulmonary resuscitation (CPR)", while Gender, Height, Weight, Days in ICU, Cardiac/ Respiratory Arrest, Witnessed, Atropine Sulfate 1mg, NaHCO3 8.4%, Calcium Gluconate 10%, and Lidocaine aren't impacting the "Survived after Cardiopulmonary resuscitation (CPR)", the critical variables have a major impact on decreasing CPR (Code Blue) in-hospital mortality rates. Subsequently, assessing in-hospital cardiopulmonary resuscitation (Code Blue) mortality at Heraa General Hospital and identify significant factors in lowering the rate over three years, there is limited evidence to support clinical decision making and the activation of rapid response team in a distressed patient. An increased awareness regarding optimizing clinical care and new research might improve outcomes.

Authors' role

AA: Project Administration, & Writing – Review and Editing.
AK: Conceptualization, Supervision, & Methodology.
AT, RA, SK, AJ, TF, AN, RM: Investigation & Data Curation
AS, MA, WA, SN: Writing – Original Draft
HA, AR: Funding Acquisition

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