



CLINICAL PROFILING OF PATIENTS RECEIVING CARDIOPULMONARY RESUSCITATION IN EMERGENCY MEDICINE DEPARTMENT.

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ABSTRACT

Topics covered by abstract: cardiopulmonary resuscitation, return of spontaneous circulation.

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Introduction: Cardiac arrest is an important public health problem and is defined by the cessation of cardiac activity. Out of hospital cardiac arrest is one of the leading causes of death and disability worldwide and contributes to 10% of the total mortality in developing countries.

Objectives-This study aims at studying the clinical profile and the immediate outcome of cardiopulmonary resuscitation for patients who achieve return of spontaneous circulation (ROSC).

study design- prospective observational study with sample size of 115 cases who presented in the Emergency Department. Adult patients aged above 18 years were included in the study. Information was collected using a standardized proforma that documented sociodemographic characteristics, initial cardiac arrest rhythm, identifiable underlying cause of arrest, medications administered, interventions performed, and the immediate outcome. The **immediate outcome** referred to the patient's condition during the period immediately following cardiopulmonary resuscitation (CPR). Data were summarized as mean ($\pm$ standard deviation), median (range), or as frequencies and percentages, depending on the nature of the variables. Additional statistical tests were applied as needed based on the study objectives. A total of **115 patients** were enrolled in the study. The mean age of patients was 61.68 $\pm$ 17.18 years. **Male patients** comprised the majority of the study population. Among the study subjects 40(34.78%) had Diabetes mellitus with/without related complications. Initial arrest rhythm was found to be non-shockable in majority of cases (89.57%), the most common primary etiology of cardiac arrest was sepsis (39.13%). Most common drug administered was adrenaline. The mean duration of CPR was found to be 17.08 $\pm$ 7.77 mins. ROSC was achieved in 87.83%. Learning points: Establishing a well-organized Emergency Medical Services (EMS) system and implementing nationwide educational initiatives are essential for increasing public awareness of CPR and ultimately enhancing survival outcomes.

MATERIALS AND METHODS

AIMS AND OBJECTIVES

PRIMARY OBJECTIVE:

To study the clinical profiling of patients achieving Return of Spontaneous Circulation (ROSC) after Cardiopulmonary resuscitation.

SECONDARY OBJECTIVE:

- 1) To study the immediate outcome of CPR
- 2)

STUDY DESIGN: This is a prospective observational study.

PLACE OF STUDY: Emergency department of Medanta Medicity, Gurgaon.

DURATION OF STUDY: 6 months

SAMPLE SIZE: The objective of the study is to evaluate the outcome of patients receiving cardiopulmonary resuscitation in Emergency Department.

Outcome Parameter = Response rate in terms of Return of spontaneous circulation

For estimation of sample size, the following formula has been used

$$n = [Z\alpha^2 P Q]/d^2$$

Where: $Z\alpha$ = Value of standard normal variate corresponding to α level of significance

P = Likely value of parameter

$$Q = 1 - P$$

d = Margin of errors which is a measure of precision

Assumptions:

P = 8 % (Ref Article)

$Z\alpha = 1.96$ (Corresponding to 95% confidence interval)

Precision (d) = $\pm 4\%$ (50% of P)

Under these assumptions the minimum sample size works out as 115.

INCLUSION CRITERIA

All adults ≥ 18 yrs receiving cardiopulmonary resuscitation and achieving ROSC in the Department of Emergency Medicine.

EXCLUSION CRITERIA

Brought dead patients

Patients who didn't achieve ROSC after CPR

DATA COLLECTION AND CLINICAL PROFILING

Data collection included patients' demographic profile, location of arrest, initial arrest rhythm at presentation, aetiology of arrest such as stroke, myocardial infarction, trauma and shock, drug administered, various interventions, immediate outcome.

IMMEDIATE OUTCOME

Immediate period after CPR that the patient is in the emergency department i.e., shifting to other locations in the hospital or out of the hospital. This includes only the period when the patient is in direct charge of the emergency of the emergency physician up to hand over to the physicians of another department like ICU/HDU

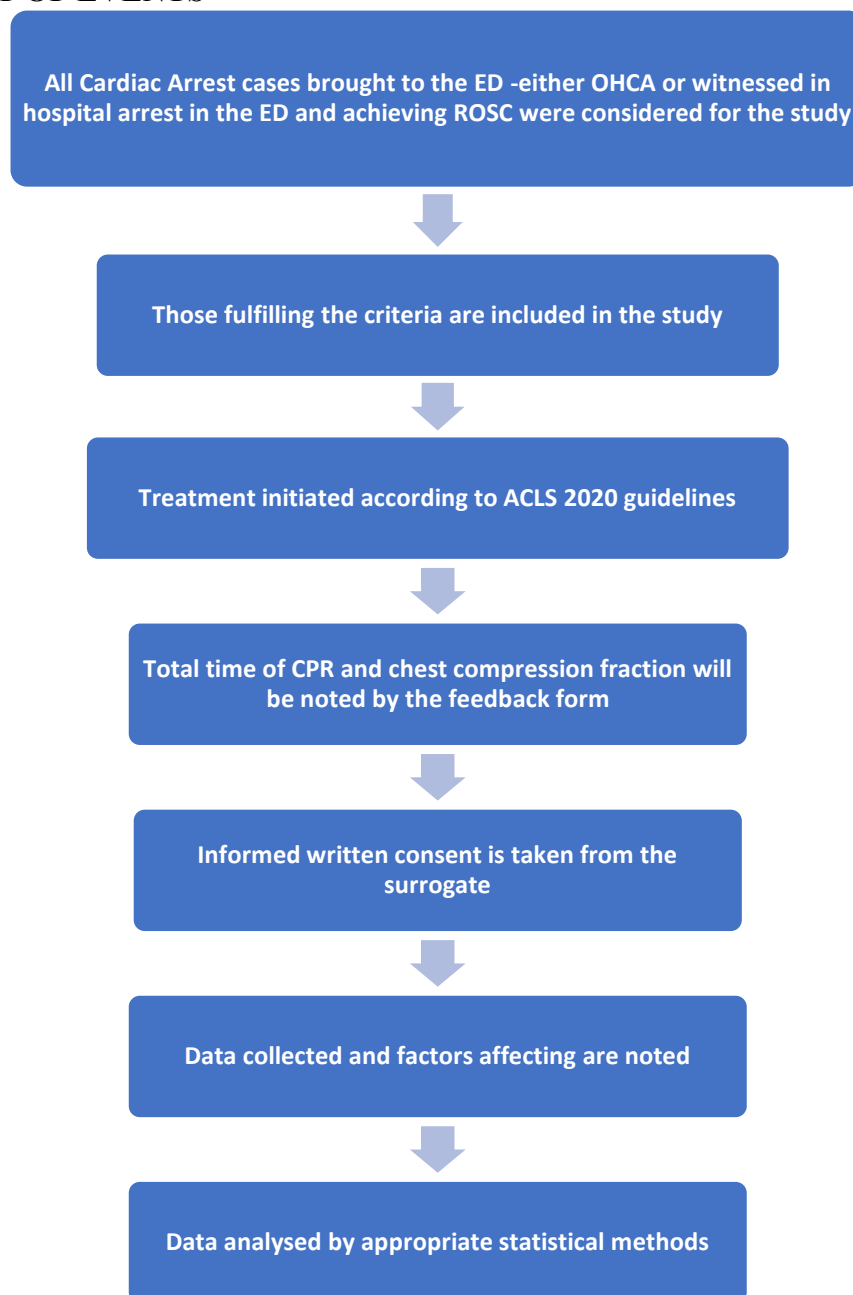
METHODOLOGY

All the adult patients ≥ 18 yrs who presented to/underwent treatment in the emergency department who went into cardiac arrest and achieved ROSC were included considering inclusion and exclusion criteria. Data was collected based on the events occurring during the resuscitation of a cardiac arrest victim. Since it was a prospective observational study, we didn't interfere or influence. Cardiopulmonary resuscitation was provided by a qualified CPR provider.

Written informed consent was obtained from legally accepted representatives of the patient fulfilling the inclusion criteria. After taking informed consent, all relevant data was collected in predesigned proforma, which included patients' socio-demographic profile, location of arrest, initial arrest rhythm, etiology of arrest, drug administered and various interventions, immediate outcome.

Resuscitation measures were initiated according to Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) – AHA- guidelines by trained healthcare providers Patients who attained ROSC after 1st attempt of CPR was followed up.

FLOW CHART OF EVENTS



STATISTICAL ANALYSIS PLAN:

The analysis includes profiling of patients on different demographic and clinical parameters. Descriptive analysis of quantitative parameters were expressed as means and standard deviation. Categorical data was expressed as absolute number and percentage. Independent Student t – test was used for testing of mean difference between two independent groups whereas paired Student t - test was used for testing the mean change. Cross tables were generated and Chi square test was used for testing of associations. P-value < 0.05 was considered statistically significant. All analysis was done using SPSS software, version 24.0.

DATA COLLECTION AND ANALYSIS:

Patients satisfying the inclusion criteria and giving consent for the present study were included.

Data was collected according to the proforma.

All statistical analysis was carried out by using SPSS statistical software.

Descriptive statistics of the baseline characteristics were presented as mean $\pm$ standard deviation, for comparison between groups Chi-square test was used.

A p value <0.05 is considered statistically significant.

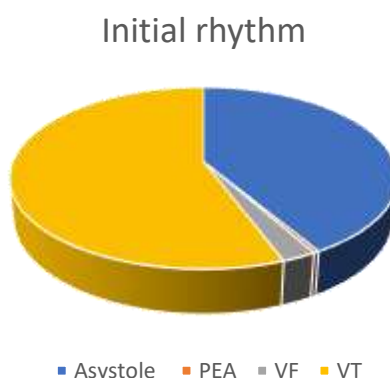
RESULTS

Total 115 cases were recruited for the study. Out of the 115 cases. The mean age of patients was 61.68 $\pm$ 17.18 years. Among the patients, males were predominant with 54% of total cases. Females were predominant among 65 to 79 years, 50 to 64 years and above 80 years age group, and in age group of 18-34 years and 35-49 years, males were predominant. (Table 1). 40(34.78%) had Diabetes mellitus with/without related complications, 27(23.4%) had Systemic hypertension and 13(11.3%) had previous COVID 19 infections.

Variable	n (%)
Gender	
• Male	62(53.91%)
• Female	53(46.09%)
Mean age	61.68years $\pm$ 17.18 (22-99)
Age group	
• 18-34Y	11(9.57%)
• 35-49Y	14(12.17%)
• 50-64Y	38(33.04%)
• 65-79Y	36(31.3%)
• >80Y	16(13.91%)

Table 1. Sociodemographic details

Initial arrest rhythm was found to be non-shockable in majority of cases, asystole in 103 cases (89.57%), and PEA in 1 case (0.87%). Shockable rhythm, VF and Pulseless VT was seen in 6(5.22%) and 4(4.35%) respectively. (Graph 1)



Graph 1: Initial arrest rhythm

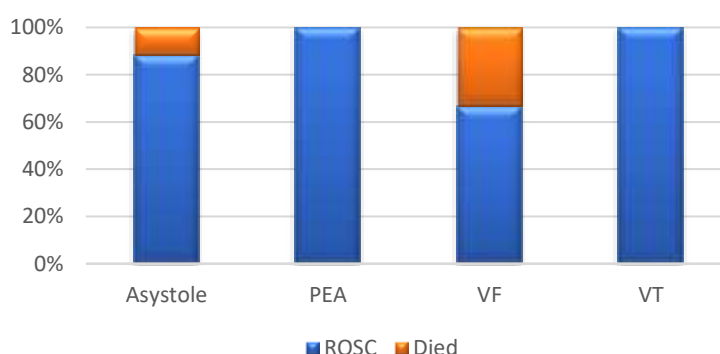
Most common primary etiology of cardiac arrest was sepsis 45(39.13%) followed by cardiac 43(37.39%) and CVA 14(12.17%). During CPR, lifesaving drugs were administered. Most common among them is adrenaline which was given in all the cases in our study. Others like calcium gluconate was given in 28(24.65%) based on blood gas analysis and/or clinical basis. Thrombolytic agents were administered in 6(5.22%). Airway protection was done mainly by endotracheal tube insertion in 110 (95.6%) cases. No emergency tracheostomy was done. In majority of cases airway was secured as a part of CPR. Confirmation of airway tube was mostly done clinically only by 5-point auscultation technique in 114(99.1%) cases. Other interventions include needle decompression 3(2.61%) was done in case of suspected pneumothorax. Mechanical or automated CPR machines, was utilized only in

3(2.61%). Blood gas analysis, either ABG and VBG was done in ED and was used to guide resuscitation in 84(73.04%) patients.

Variable	n (%)
Etiology	
• Sepsis	45(39.13%)
• Cardiac	43(37.39%)
• CVA	14(12.17%)
• Trauma	11(9.57%)
• Sepsis + RF	1(0.87%)
• Cardiac + Sepsis	1(0.87%)
Drugs Administered	
• Adrenaline	115 (100%)
• Amiodarone	20(17.39%)
• Lignocaine	10(8.7%)
• Calcium gluconate	28(24.35%)
• Thrombolytic agent (Alteplase)	6(5.22%)
Airway intervention	
• ET tube	110 (95.6%)
• Needle cricothyroidotomy	0
• Emergency tracheostomy	0
Tube Confirmation	
• 5-point auscultation	114 (99.1%)
• Not applicable (Patient came with tracheostomy)	1 (0.9%)

Table 2: Resuscitation parameters

ROSC was maintained till shifting out of ED in 101(87.83%) patients, while 14(12.17%) patients had repeat arrest and could not be revived. The mean duration of CPR was found to be 17.08 ± 7.77 mins. There was no significant difference on comparing the immediate outcome with gender, percentage ROSC in males and females were 90.32% and 84.91%% respectively. (p-value: 0.3779). The percentage ROSC in asystole, PEA, VF and pVT were found to be 88.34%, 100%, 66.66% and 100% respectively. (p value- 0.3419). (Graph 2). Percentage of immediate ROSC was found to be more than 50% in all the cases with cardiac, metabolic and traumatic etiology. The immediate outcome comparisons were summarized in Table 3.



Graph 2: Immediate outcome with initial arrest rhythm

	Immediate outcome		P value
	ROSC (%)	Died (%)	
Overall	101 (87.83%)	14 (12.17%)	0.967
Gender			
• Male	56(90.32%)	6 (9.68%)	0.37

• Female	45(84.91%)	8(15.09%)	
Age groups			
• 18-34Y	10 (90.91%)	1 (9.09%)	
• 35-49Y	11 (78.57%)	6 (21.43%)	
• 50-64Y	27 (40.9%)	39 (59.1%)	0.612
• 65-79Y	33 (91.67%)	3 (8.33%)	
• ≥80Y	15(93.75%)	1 (6.25%)	
Initial rhythm			
• Asystole	91 (88.34%)	12 (11.66%)	
• PEA	1 (100%)	0 (0%)	0.34
• VF	4 (66.66%)	2 (33.33%)	
• pVT	5 (100%)	0 (0%)	

Table 3. Immediate outcome comparison

DISCUSSION

This study is a prospective observational study to analyse the clinical profile of the patients who achieved ROSC after CPR in ED. Patients who achieved ROSC after CPR in the emergency department were included in the study. The cases were followed up to assess immediate outcome of CPR. Immediate outcome of CPR was defined as immediate period after CPR that the patient is in the emergency department i.e., shifting to other locations in the hospital or out of the hospital. This includes only the period when the patient is in direct charge of the emergency of the emergency physician up to hand over to the physicians of another department like ICU/HDU or LAMA.

1. Demographic profile, symptoms and comorbidities

Our study looked into the age and gender distribution of the study population. Majority of patients belong to the age group of 50-64 years (33.04%) followed by 65-79Y (31.3%). There were 16 cases with age more than 80 years. Mean age in our study was 68.68 years. Age distribution our study is similar to other reports like Swedish registry study by Al-Dury *et al*, and also the Cardiac arrest Registry to Enhance Survival latest 2019 Annual report¹³.

Males constituted majority of the patients in our study. Among these patient's males and female cases were 62 and 53 respectively. Males (60.4%) also exceeded females in the Pan-Asian study by Ng *et al* on resuscitation attempted by emergency medical services¹⁴. Similar finding was also seen in 2019 CARES annual report, with 62.2% males.

Among the study subjects 40(34.78%) had Diabetes mellitus with/without related complications, 27(23.4%) had Systemic hypertension and 13(11.3%) had previous COVID 19 infections. 8(6.95%) patients were having CKD and carcinoma each. 8(6.95%) patients had both DM and HTN. 5(4.3%) patients had HTN and CKD, while 3(2.6%) patients had DM and AKI.

2. Initial arrest rhythm

Majority of cases in our study had non-shockable rhythm i.e.90.44%, Asystole was the most common with 89.57% followed by VF 5.22%. Shockable rhythm, VF and pulseless VT was seen in 5.22% and 4.35% respectively. This finding was consistent with the United Kingdom National Cardiac Arrest Audit Database by Nolan *et al*, which showed 72.3% cases had non-shockable rhythm. Similar finding was also seen in study by Khan *et al*, in a tertiary center in Pakistan and another study by Bansal *et al* in Medical ICU in North India.^{15,16}

3. Aetiology of arrest

In our study we found that in the cases that need resuscitation for cardiac arrest in our ED, most common identifiable primary aetiology was sepsis (39.13%) followed by cardiac causes (37.39%). In a study by Suraseranivongse *et al* in 2015, most common cause was respiratory (24.7%) followed by septic shock (23.3%). In a study by Wallmuller *et al*¹⁷, cardiac (63%) cause was most common followed by respiratory diseases (15%), among them 35% patients had acute myocardial infarction.

Metabolic, cerebral, sepsis causes each ranged between 1 and 4% of their cohort. In another study by Shao *et al* (2016)¹⁸, cardiac causes were the most common with 47.6%, followed by respiratory causes (17%), trauma 7.5% and neurological causes 4.3%. Similarly, Trpković *et al* (2015) study found 61% such cases with cardiac aetiology¹⁹. The differences are mainly because the profile of patients that comes to our ED. Since ours is a tertiary care referral hospital, many of the daily visit patients are critically ill with several life-threatening comorbidities. There may also be a changed profile of patients visiting ED, post COVID pandemic. This may require a separate study in future.

4. Drug administered and other intervention

During CPR lifesaving drugs are administered based on the ACLS guidelines. Most commonly used among them is adrenaline which was given in all the cases in the study. Other drugs like calcium gluconate were given in 28(24.65%). Thrombolytic agents were also used in 6(5.22%) patients. Many interventions were also performed depending on history, etiology and other clinical findings, to address any reversible cause.

Airway protection was done by endotracheal tube insertion in 110 (95.6%) cases. In majority of cases airway was secured as a part of CPR. Confirmation of endotracheal tube was done clinically only by 5-point auscultation technique in 114(99.1%) cases.

Other interventions include needle decompression 3(2.61%) was done in case of suspected pneumothorax. Mechanical or automated CPR machines, was utilized only in 3(2.61%). Blood gas analysis, either ABG and VBG was done in 84(73.04%) patients.

5. Immediate outcome

Immediate outcome was studied in patients who achieved ROSC after CPR. In that 87.83% patients-maintained ROSC in our study till shifting out of ED, while 12.17% patients suffered repeat cardiac arrest and died during the immediate period. Mean duration of CPR in these patients was 17.08+7.77minutes. Immediate Outcome of patients based on the age group were also assessed.

The percentage ROSC in the age group 18-34Y, 35-49Y, 50-64Y, 65-79Y and more than 80Y were found to be 90.91%, 78.57%, 84.21%, 91.67% and 93.75% respectively. (p value- 0.6123).

Our study also compared immediate outcome with initial arrest rhythm. ROSC was seen maximum in as pVT (100%) and asystole (88.6%) rhythms (P value- 0.34). This may be due to vast number of chronic kidney pts and sepsis induced acute kidney injury patients that need resuscitation in our ED, who have correctable causes like hyperkalemia and metabolic acidosis. Percentage of immediate ROSC was found to be more than 50% in all the cases with cardiac, metabolic and traumatic etiology with highest in cardiac etiology 89%. Our study didn't show any significant statistical difference between ROSC with respect to the gender, ROSC in males and females where 90% and 84% respectively. Though in different literatures by Al-Dury *et al*, Ng *et al*, Chen *et al* and Herlitz *et al*, women had comparatively higher chance of survival^{13,18,20,21}.

LIMITATIONS OF STUDY

1. This is an observational study, the factors associated with outcome does not necessarily prove causality and may be confounded by unmeasured factors, and difference in procedural skills.
2. This is a limited time study and does not account for disease prevalence associated with seasonal change.
3. Only patient with witnessed cardiac arrest were included, while others who presented with arrest and received CPR outside hospital were excluded.

CONCLUSION

The outcome of cardiac arrest in developing countries like India remains dismal when compared to western world. Lack of bystander CPR and weaker underutilized and under-equipped emergency medical services (EMS) leading to a delay in receiving critical interventions were some of the important challenges. The pre-hospital care received by the victims needs immediate attention. It's important to establish well-structured Emergency Medical Service system and conduct educational

programs at the national level to improve public awareness of CPR intervention to improve survival rates. We propose development of a robust cardiac arrest registry in India, which will help filling some gaps in the existing knowledge and also facilitate future research.

REFERENCES

1. Jacobs I, Nadkarni V, Bahr J, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update and simplification of the Utstein templates for resuscitation registries. A statement for healthcare professionals from a task force of the international liaison committee on resuscitation (American Heart Association, European Resuscitation Council, Australian Resuscitation Council, New Zealand Resuscitation Council, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Southern Africa). *Resuscitation* 2004; 63: 233-49.
2. Cummins RO, Ornato JP, Thies WH, Pepe PE. Improving survival from sudden cardiac arrest: the "chain of survival" concept. A statement for health professionals from the Advanced Cardiac Life Support Subcommittee and the Emergency Cardiac Care Committee, American
3. Rao BH, et al. Contribution of sudden cardiac death to total mortality in India - a population based study. *Int J Cardiol.* 2012;154(2):163-7
4. Oransky I. Obituary Peter Safar. *The Lancet* 2003; 362: 749
5. Cardiopulmonary resuscitation: Statement by the Ad Hoc Committee on Cardiopulmonary Resuscitation of the Division of Medical Sciences, National Academy of Sciences, National Research Council. *JAMA* 1966; 198: 372-9.
6. Kouwenhoven WB, Jude JR, Knickerbocker GG. Closed-chest cardiac massage. *JAMA* 1960;173:1064-7.
7. Nolan JP, Soar J, Smith GB, Gwinnutt C, Parrott F, Power S, et al. Incidence and outcome of in-hospital cardiac arrest in the United Kingdom National Cardiac Arrest Audit. *Resuscitation* 2014;85:987-92.
8. Berdowski J, de Beus MF, Blom M, Bardai A, Bots ML, Doevendans PA, et al. Exercise-related out-of-hospital cardiac arrest in the general population: Incidence and prognosis. *Eur Heart J* 2013;34:3616-23.
9. Krittayaphong R, Saengsung P, Chawaruechai T, Yindeengam A, Udompunterak S. Factors predicting outcome of cardiopulmonary resuscitation in a developing country: The Siriraj cardiopulmonary resuscitation registry. *J Med Assoc Thai* 2009;92:618-23.
10. Lundy DJ, Ross SE, Schorr C, Jones AE, Trzeciak S. Outcomes of trauma victims with cardiac arrest who survive to Intensive Care Unit admission. *J Trauma* 2011;71:E12-6.
11. Murthy S, Wunsch H. Clinical review: International comparisons in critical care – Lessons learned. *Crit Care* 2012;16:218.
12. Das AK, Gupta SB, Joshi SR, Aggarwal P, Murmu LR, Bhoi S, et al. White paper on academic emergency medicine in India: INDO-US Joint Working Group (JWG). *J Assoc Physicians India* 2008;56:789-98.
13. Al-Dury, N. *et al.* Characteristics and outcome among 14,933 adult cases of in-hospital cardiac arrest: A nationwide study with the emphasis on gender and age. *Am. J. Emerg. Med.* **35**, 1839–1844 (2017).
14. Ng, Y. Y. *et al.* Associations between gender and cardiac arrest outcomes in Pan-Asian out-of-hospital cardiac arrest patients. *Resuscitation* **102**, 116–121 (2016).
15. Bansal, A., Singh, T., Ahluwalia, G. & Singh, P. Outcome and predictors of cardiopulmonary resuscitation among patients admitted in Medical Intensive Care Unit in North India. *Indian J. Crit. Care Med. Peer-Rev. Off. Publ. Indian Soc. Crit. Care Med.* **20**, 159–163 (2016).
16. Khan, N. U. *et al.* Cardiopulmonary resuscitation: outcome and its predictors among hospitalized adult patients in Pakistan. *Int. J. Emerg. Med.* **1**, 27–34 (2008).
17. La, R., Sm, S., Hn, A. Y., Ma, A. & Kz, A. Incidence, Characteristics, and Survival Trend of Cardiopulmonary Resuscitation Following In-hospital Compared to Out-of-hospital Cardiac

- Arrest in Northern Jordan. *Indian J. Crit. Care Med. Peer-Rev. Off. Publ. Indian Soc. Crit. Care Med.* **21**, 436–441 (2017).
18. Shao, F. *et al.* Incidence and outcome of adult in-hospital cardiac arrest in Beijing, China. *Resuscitation* **102**, 51–56 (2016).
 19. Trpković, S., Pavlović, A., Bumbasirević, V., Sekulić, A. & Milicić, B. [Outcome among patients suffering from in-hospital cardiac arrest]. *Srp. Arh. Celok. Lek.* **142**, 170–177 (2014).
 20. Herlitz, J. *et al.* Characteristics of cardiac arrest and resuscitation by age group: an analysis from the Swedish Cardiac Arrest Registry. *Am. J. Emerg. Med.* **25**, 1025–1031 (2007).
 21. Chen, N. *et al.* Arrest etiology among patients resuscitated from cardiac arrest. *Resuscitation* **130**, 33–40 (2018).