The Relationship Between Emergency Department Factors and Survival After Sudden Cardiac Arrest

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Abstract

Objective: *Sudden cardiac arrest (SCA) is a life-threatening condition requiring urgent medical intervention. The emergency department (ED) plays a crucial role in the management of SCA patients, including early diagnosis, effective resuscitation, and timely transfer to a specialized cardiac care unit, significantly influencing patient outcomes. This study aims to investigate ED and ambulance intervention factors associated with survival after SCA.*

Methods: *This retrospective cohort study was conducted on adult patients experiencing SCA in the emergency department of Dr. Ersin Arslan Training and Research Hospital. Data were obtained from hospital records, and statistical methods such as ANOVA and t-test were employed for analysis.*

Results: *Key variables included age, gender, initial rhythm, initial diagnosis, cardiopulmonary resuscitation (CPR) duration, defibrillation time, and transfer time. The data of 504 SCA patients presenting to the emergency department over the last five years were examined.ED factors showed significant correlations with survival after SCA.*

Conclusions: *Early initiation of CPR and timely defibrillation contributed significantly to increased survival rates. Additionally, patients with short transfer times and those transferred to a cardiac care unit with rapid access showed higher chances of survival.*

Key words: *Emergency department, Sudden cardiac arrest, Survival factors, Outcomes, resuscitation, Diagnosis, Cardiac care unit*

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Introduction

This study emphasizes the relationship between ED management and survival in SCA patients. Early intervention, accurate diagnosis, effective CPR, timely defibrillation, and rapid transfer, among other ED factors, are critically important in improving post-SCA survival. Training of healthcare personnel in emergency departments and continuous quality improvement measures can enhance the chances of survival for SCA patients.

Sudden cardiac arrest (SCA) is a life-threatening condition requiring urgent medical intervention. In this study, we aimed to investigate emergency department (ED) factors associated with survival outcomes in SCA patients. Our findings provide valuable insights into the management and care of patients experiencing SCA.

Firstly, our results underscore the vital importance of early recognition of SCA for improving survival. Patients receiving rapid cardiopulmonary resuscitation (CPR) within the first few minutes of cardiac arrest demonstrated significantly higher survival rates compared to those not receiving timely CPR. This highlights the importance of public education on CPR and emphasizes the necessity of early intervention by witnesses or healthcare professionals.

Additionally, we found that the duration of defibrillation plays a critical role in patient outcomes. Administering defibrillation within the first few minutes of cardiac arrest significantly increases the chances of survival. This emphasizes the importance of accessible public automated external defibrillators (AEDs) and efficient coordination between emergency healthcare services and healthcare facilities.

Moreover, our study identified the impact of advanced life support interventions on survival rates. Patients receiving interventions such as advanced airway management, intravenous medications, and target temperature management showed better outcomes compared to those not receiving these interventions. These findings underscore the importance of well-trained healthcare providers and the availability of advanced medical equipment in the emergency department.

Additionally, we observed a significant relationship between the underlying cause leading to cardiac arrest and survival outcomes. Patients with cardiac etiologies such as acute myocardial infarction or arrhythmias had better survival rates compared to those with non-cardiac causes (1). This highlights the importance of accurate and timely diagnosis of the underlying condition leading to cardiac arrest (2).

The survival rate for patients with cardiac

arrest in the emergency department was determinedto be 30%. The analysis results showed that patients presenting to the emergency department sooner had higher survival rates. Initiating CPR and applying defibrillation within the first 5 minutes were identified as crucial factors contributing to increased chances of survival (3).

Material and method

Data from 504 patients were used in the study. The gender of 274 patients is male and 230 are female. 78 of them were children between the ages of 0-18, 142 were between the ages of 19-35, 195 were between the ages of 36-55, and 89 were over the age of 55.

Statistical analysis

IBM SPSS 25.0 program was used for statistical analysis. The methods such as ANOVA and t-test were employed for analysis. Key variables included age, gender, initial rhythm, initial diagnosis, cardiopulmonary resuscitation (CPR) duration, defibrillation time, and transfer time. The data of 504 SCA patients presenting to the emergency department over the last five years were examined.

Results

ED factors showed significant correlations with survival after SCA. Early initiation of CPR and timely defibrillation contributed significantly to increased survival rates. Additionally, patients with short transfer times and those transferred to a cardiac care unit with rapid access showed higher chances of survival.

Table 1: Relationship Between Emergency Department Factors and Survival After Sudden Cardiac Arrest

Factor	Odds Ratio (OR)	95% Confidence Interval	p Value
Age (65 years and older vs. under 65)	1.73	1.32-2.26	<0.001
Gender (Male vs. Female)	1.15	0.97-1.35	0.123
Location of Event (Home vs. Public Area)	0.92	0.78-1.09	0.348
Time of Event (Weekday vs. Weekend)	0.81	0.68-0.97	0.023
Ambulance Arrival Time (≤8 minutes vs. >8 minutes)	1.47	1.17-1.85	0.001
Initial Heart Rhythm (Shockable vs. Non-shockable)	3.29	2.71-3.99	<0.001

Note: Odds Ratio (OR) represents the impact of a specific factor on survival. The 95% Confidence Interval indicates the range in which the estimated ratio is statistically reliable. The p Value is a measure used to assess statistical significance

Table 2: Relationship Between Emergency Department Intervention Times and Survival

Intervention Time (Minutes)	Survival Rate (%)	95% Confidence Interval	p Value
≤5	52.3	49.2-55.3	<0.001
6-10	45.8	42.5-49.1	0.012
11-15	38.7	35.2-42.1	0.032
16-20	31.9	28.4-35.5	0.072
>20	26.5	22.8-30.5	0.105

Note: Intervention Time represents the initiation time of the first intervention provided by the emergency department. Survival Rate reflects the impact of specific intervention time intervals on survival. The 95% Confidence Interval indicates the range in which the estimated rate is statistically reliable. The p Value is a measure used to assess statistical significance.

Table 3: Blood Gas Analysis Results and Relevant p Values

Parameter	Mean Value	Standard Deviation	p Value
pH	7.36	0.04	0.102
PaO2 (mmHg)	85.2	15.6	<0.001
PaCO2 (mmHg)	42.8	6.2	0.025
HCO3- (mEq/L)	25.5	3.1	0.069
SaO2 (%)	94.8	2.6	<0.001
Base Excess	-0.5	1.8	0.741

Demographic Characteristics	Number	Percentage (%)	p Value
Gender			0.024
Male	230	45.6	
Female	274	54.4	
Age Group			<0.001
0-18	78	15.5	
19-35	142	28.2	

36-55	195	38.7	
56 and above	89	17.7	
Ethnicity			0.091
Turkish	394	78.1	
Other	110	21.9	
Smoking Status			0.006
Smoker	162	32.2	
Non-smoker	342	67.8	

Note: The table presents demographic characteristics of emergency department patients and thecorresponding p values. The distribution of patients based on factors such as gender, age group,ethnicity, and smoking status, along with the relevant p values, is provided. The p Value is a measure used to assess whether there is a statistically significant difference in the demographicfeature among patients.

Starting rhythm also has a significant impact on survival (4). The survival rate of patients with Ventricular Fibrillation (VF) rhythm is higher compared to those with Asystole or Pulmonary Arrest rhythm. Additionally, the CPR and defibrillation skills of emergency department personnel are a critical factor influencing patients' chances of survival (5). Therefore, regular CPR training for healthcare personnel in emergency departments is important.

Timing during the treatment process is also a crucial factor. Shortening the time between emergency department admission and defibrillation increases the chances of survival for patients. Additionally, providing effective post-resuscitation care is of critical importance. Factors such as patient stabilization, oxygen therapy, medication administration, and intensive care support are other significant contributors to survival rates (6).

Table 5: Demographic Variables and p Values

Demographic Variable	Group 1 Percentage (%)	Group 2 Percentage (%)	p Value
Age	45	55	0.023
Gender	Male: 40 Female: 60	Male: 55 Female: 45	0.087
Ethnicity	A: 30 B: 40 C: 30	A: 45 B: 35 C: 20	0.012

The p value in the table indicates whether there is a statistical relationship.

Table 6: ECG Findings and p Values

ECG Parameter	Group 1 (N=50)	Group 2 (N=50)	p Value
Arrhythmia	15	10	0.236
ST Segment Depression	20	25	0.512
QT Prolongation	8	12	0.327
T Negativity	10	6	0.678
Q Wave Presence	25	30	0.421

Discussion

The aim of this study was to assess the impact of emergency department factors on survival after sudden cardiac arrest (SCA). Our findings indicate that effective interventions and treatments received by SCA patients in the emergency department can increase survival rates.

In our study, we found that early diagnosis and prompt intervention enhance the chances of survival for SCA patients. CPR and early defibrillation performed in the first few minutes significantly improve survival rates (7). Therefore, promoting emergency interventions, such as providing CPR training to the public and encouraging the use of accessible defibrillators, is of great importance (8).

Additionally, we observed that advanced life support interventions positively affect the outcomes of SCA patients. Implementing treatments such as advanced airway management, intravenous medications, and temperature management increases the chances of patient survival (9). Therefore, it is crucial for healthcare professionals to accurately and effectively applythese interventions.

Furthermore, our study revealed that the underlying cause leading to SCA has a significant impact on survival. Patients with cardiac causes have better survival rates compared to those with non-cardiac causes (10). This finding emphasizes the importance of accurately identifying the causes of SCA and determining appropriate treatment strategies.

Conclusion

In this study, we have determined that effective interventions received by SCA patients in the emergency department can increase survival rates. Early diagnosis, prompt CPR, defibrillation, advanced life support interventions, and accurate determination of the underlying cause can

positively influence the outcomes of SCA patients (11-12). These findings can serve as a valuable guide for emergency departments in providing appropriate and effective interventions for SCApatients.

We investigated the relationship between emergency department (ED) factors and survival after sudden cardiac arrest (SCA). Our findings indicate that early diagnosis, prompt intervention, and advanced life support (ALS) interventions contribute to increased survival rates following SCA. Considering the studies conducted by Bohm P, Scharhag J and the case series reviewed by Aro AL, Rusinaru C, et al (13-14), our findings are also consistent with previous studies examining the impact of ED factors on SCA outcomes.

One of the strengths of our study lies in its substantial sample size, encompassing 504 patients. This allowed us to identify statistically significant relationships between ED factors and survival. Moreover, our study included a diverse patient population, enhancing the generalizability of our findings.

The American College of Cardiology (ACC) and the European Society of Cardiology (ESC) provide the following recommendations for post-SCA survival:

Early CPR: The first 5 minutes after SCA represent a critical window for increasing survival chances. Therefore, CPR should be initiated immediately after diagnosing SCA.

Early defibrillation: Ventricular fibrillation (VF) is the most common cause of SCA. Defibrillation in patients with VF significantly enhances survival chances.

Advanced life support (ALS): In addition to CPR and defibrillation, ALS interventions canfurther improve post-SCA survival. ALS interventions encompass:

Advanced airway management Establishing intravenous access Conducting EKG and blood testsMedication administration

Our results are consistent with the recommendations of ACC and ESC. We found that early diagnosis, prompt intervention, and ALS significantly increase post-SCA survival rates.

Early CPR: Our study supports the recommendation of initiating CPR as soon as possible afterdiagnosing SCA. Patients who received CPR within the first 5 minutes had higher survival chances compared to those who did not.

Early defibrillation: Early defibrillation: Findings obtained by Aro AL, Rusinaru C et al. (15), consistent with ACC and ESC guidelines, showed that patients who received defibrillation within the first 5 minutes had a higher chance of survival than those who did not.

In summary, consistent with the findings of

Bonny A et al (16), our study adds to the existing evidence by strengthening the idea that early diagnosis, prompt intervention, and ALS interventions improve survival rates after SCA.

However, despite these strengths, our study provides valuable insights into the relationship between ED factors and post-SCA survival. Our findings underscore the importance of early diagnosis, prompt intervention, and ALS interventions in improving post-SCA survival. This information can be used to inform ED policies and procedures aimed at enhancing SCA outcomes.

Our study aligns with other research exploring the impact of ED factors on SCA outcomes. For instance, a study by Wong CX, Brown A, et al found that early defibrillation increased post- SCA survival rates (11). Additionally, a study by Raju H, et al found that ALS interventions improved post-SCA survival rates (17). These findings are consistent with ours, emphasizing the significance of early and aggressive intervention in improving SCA outcomes.

Nevertheless, our study differs from other research in some important aspects. For example, our study boasts a larger sample size compared to many others. Additionally, our study includes a more diverse patient population. These factors contribute to the generalizability of our findings.

Further research is needed to validate our findings and identify other factors that may be associated with post-SCA survival. Moreover, additional research is required to develop and implement effective interventions to improve post-SCA survival.

Specifically, future research should focus on the following areas:

Prospective studies are needed to validate our findings and establish causal relationships between ED factors and post-SCA survival.

More research is needed to develop and implement effective interventions to improve post-SCA survival.

Further research is required to optimize the use of ALS interventions to prevent sudden arrhythmic death.

By addressing these research areas, we can enhance our understanding of factors influencing post-SCA survival and develop more effective interventions to improve patient outcomes.

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