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EVALUATION OF CODE BLUE AT DOKUZ EYLUL UNIVERSITY, MEDICAL FACULTY HOSPITAL

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Summary

Code blue is a code system that aims to increase the success of Cardiopulmonary Resuscitation (CPR) with rapid and effective intervention in in-hospital cardiopulmonary arrests all over the world. Each hospital has to create a Code Blue operation suitable for its own facilities.

Aim

In this study, it was aimed to investigate the Code Blue applications, the reasons for the call, the quality of the intervention and the mortality rates in Dokuz Eylül University Hospital (DEÜTF).

Materials and Methods

Code Blue calls within nine months (July 2019 - March 2020) after ethics committee approval were prospectively examined. Demographic data, diagnosis, comorbidities, length of stay in the ward and, if cardiopulmonary arrest developed, characteristics related to CPR applications were recorded. Code Blue registration form was filled after the intervention and the data were analysed statistically.

Of the 127 calls included in the study, 7 of them were false calls, and 60 were calls made in the non-hospitalized patient group and directed to the paramedic team. Code Blue calls were made due to cardiac arrest in 23, respiratory arrest in 13, and endotracheal intubation in 17 patients with critical general condition. Two of these were from non-hospitalized cases.

The mean time to reach the place where the call came from was 2.76±0.95 minutes. It was determined that 63 of the 67 Code Blue calls directed to the anaesthesia team were made from inpatient services and 4 from intensive care units. In the initial rhythm evaluation of the patients who underwent cardiopulmonary resuscitation, rhythms that were not shocked in 33 cases and shocked rhythms in 3 cases were determined. Spontaneous circulation was restored in 15 (41.7%) of the patients who underwent CPR, while death occurred in 21 (58.3%) cases.

Discussion and Results

It is seen that approximately one third of the Code Blue calls are those that comply with the Code Blue definition, while the others are "urgent" medical help calls for patients whose general condition deteriorates. This result is expected when there are no separate teams for cardiac arrests and other medical emergencies. Therefore, it may be considered to form separate teams.

In our hospital, it is necessary to detect and prevent situations that may cause cardiac arrests at an early stage and to provide regular in-house trainings for this purpose.

KEYWORDS: Code blue, Cardiopulmonary resuscitation, In-hospital cardiac arrest.

Introduction

The incidence of in-hospital cardiac arrest is approximately 200,000 per year, and survival after cardiac arrest ranges from 11% to 35%. [1,2] It is stated that this significant difference between the rates may be due to the practices that may vary from hospital to hospital, and it is suggested that studies should be increased in order to obtain scientific data to increase survival rates after in-hospital cardiac arrest.[3] Cardiopulmonary resuscitation (CPR) is defined as maintaining the airway patency and supporting the respiratory and circulatory system of a patient whose respiratory and circulatory system has stopped for any reason.

Code Blue system has been created for emergency cardiac arrest events that can be foreseen or unpredictable in big hospitals all over the world and in Turkey. The application was first started in July 2000 in Southern California, United States (USA) and is the only code in which the colour blue is used in international colour code applications. [4] Its widespread use in our country has started with service quality standards since 2008 (www.kalite.saglik.gov.tr).[5]

According to an official notification by the Ministry of Health in 2009 and the Patient and Employee Safety Regulation published in 2011, it has been made compulsory to be applied in hospitals.[6] In addition, within the scope of the Ministry of Health's Health

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Performance and Quality Directive dated 2011 and numbered 9489, the application is included in the Hospital Service Quality Standards and is evaluated. For the development of the national terminology and the generalization of the application, the use of the phone activation call system numbered 2222 was approved and adopted by the Ministry. The same number is also used throughout Europe, and Turkey is among the first countries to implement it.

The aim of this study is to evaluate the blue Code Blue applications in our hospital. The primary aim is to determine the reasons for the Code Blue calls, where the calls were made and the nature of the intervention when the Code Blue team arrived at the scene. In addition, mortality and discharge rates after the intervention of the Code Blue team were also examined.

Method

In this study, Code Blue notification records were kept for 18 months between 12 July 2019 and 12 January 2021 in the Code Blue system, which is actively applied in Dokuz Eylül University Medical Faculty Hospital, after the approval of the non-interventional ethics committee (decision no: 2019/14-36) was obtained in our hospital. It was planned to be investigated prospectively.

However, due to the declaration of the COVID-19 pandemic on March 11, 2020 in our country, as in the whole world, and the changes in the blue Code Blue operation in our hospital in line with the pandemic conditions, the anticipated case collection period was shortened and ended in March 2020. The data used here belong to the Code Blue operation before the pandemic and covers a period of 9 months after July 12.

The team includes an assistant doctor and anaesthesia technician from the Anaesthesiology and Reanimation Clinic. The Code Blue response team is re-determined every month. Apart from the designated teams, every member of the clinic is included in the code blue team and contributes to the intervention, if necessary.

The blue Code Blue system of our hospital is activated by coding the 2222 internal phone number and is reflected on three separate devices. In our clinic, the call reaches the anaesthesia resident doctor and the anaesthesia technician at the same time. Anaesthesia resident reaches the call place with the anaesthesia technician and makes the necessary intervention. People who carry the dect phone of the Code Blue are the assistants who work in the Anaesthesia Intensive Care during working hours and know beforehand that he is responsible for the Code Blue, and the senior resident who is on duty in the operating room during the shift hours. As soon as the Code Blue call is made, the calling clinic, the hospital floor where the clinic is located and the extension phone number appear on the blue code dect phone screen. While the response team sets out to reach the announcement area as soon as possible, they try to find out the situation that requires a call by calling back the number from which the call came. The time from the moment the call is made until the response team reaches the call area is recorded as the time to reach the scene. The blue code team consisting of doctors and technicians handles CPR management and makes the necessary CPR intervention in accordance with the algorithms. The primary doctor and nurse of the patient are expected to have the equipment ready at the time of the incident and to bring the emergency carts, monitor and defibrillator to the patient when they initiate the call. Code Blue calls given for non-hospitalized patients/people who may be in or around the hospital gardens, at the clinics, imaging centres or corridors outside the hospital service fall on the call devices of the emergency service-paramedic teams. Incoming calls for this group were defined as 'outpatients' in the findings section. Emergency paramedic teams make the first intervention to the patient and call the anaesthesiologist to the scene in case of cardiopulmonary arrest. Code Blue (CPR) registration form is filled by the anaesthesiologist or paramedic after all the intervention is completed. One copy of the Code Blue (CPR) registration form is collected in the patient file and the other copy is collected in the Code Blue team or the secretariat deemed appropriate by the team.

Data under the following headings are recorded in the Code Blue Registration Form. These figures were used in this study.

Evaluation of Code Blue Information

Call Information; reason for call; demographic data of the patient; practices before the CPR (CODE BLUE) Team came; CPR information; Code Blue team information and what has been done after the CPR (CODE BLUE) Team arrives; what has been done after the end of CPR, whether spontaneous circulation was restored or not and the final status of the patient were recorded. In addition, the duration of intensive care and hospital stay were evaluated.

STATISTICAL ANALYSIS

Statistical analyses of the data obtained in the study were performed using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) Data package program SPSS (Statistical Package for Social Science) 24.0. Frequency data were shown as numbers (n) and percentage (%). In statistical analysis; Chi-square test was used in the analysis of the data obtained by counting.

5. RESULTS

Of the 127 calls included in this study, 7 (5.5%) were considered as false calls and 120 (94.5%) were considered correct calls.

After excluding accidental calls, 23 (19.2%) of the remaining 120 Code Blue calls were cardiac arrest, 13 (10.8%) respiratory arrest, 17 (14.2%) planned endotracheal intubation in the patient whose general condition became critical. (ETT), 6 (5%) were given due to vascular access and 4 (3.3%) due to mechanical

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ventilator adjustment **(Table 1)**. Sixty, 60 (50%) of the Code Blue code calls were evaluated as calls given for the non-hospitalized patient group and were directed to the paramedics. Two of these cases were cardiac arrest and 1 was determined as a false call. For patients with cardiac arrest, we were called by the paramedic and included in the intervention. Two patients with cardiac arrest, who were not hospitalized, were included in the group of patients with cardiac arrest in which the Anaesthesiology and Reanimation team intervened. Out of 120 calls identified as correct Code Blue calls, 63 (52.9%) of the patients were female and 56 (47.1%) were male. The mean age of the patients was determined as 60.00±18.63 years. When the age distribution of the patients was examined, the lowest age was 15 and the highest was 96. The mean age of the females in the Code Blue calls which was included in the study was 60.34±20.29 years, and the average age of the male cases was 59.60±16. There was no statistically significant difference between male and female cases in terms of mean age (p=0.828). When the blue Code Blue made cases without hospitalization are examined; Code Blue was given in 20 cases because of syncope, 15 cases with presyncope, 12 cases with chest pain, worsening with chest pain, 8 cases with seizures, 2 cases falling from their level, 2 cases hitting their head after falling from a height, and 1 call was a false Code Blue call. It was determined that 2 Code Blue cases who fell from height had cardiac arrest. After excluding 1 false Code Blue, 33 of the patients were discharged from the emergency department with the recommendation of outpatient control, and 7 were treated by hospitalization. While one patient with cardiac arrest died in the emergency room, the other patient was transported to the intensive care unit by providing Return of Spontaneous Circulation (ROSC).

On the other hand, 17 patients refused to be treated in the emergency department and the treatment was seized.

Table 1. Reasons To Make Code Blue Calls

Call Reason	n (%)
Cardiac arrest (2 cases without hospitalization)	23 (%18,1)
Respiratory arrest	13 (%10,2)
Planned ETT in the critically ill	17 (%13,4)
Vascular access	6 (%4,8)
Mechanical ventilator setting	4 (%3,1)
Cases without hospitalization (After cardiac arrest and false code rule out)	57 (%44,9)
False code	7 (%5,5)

According to this table, the appropriate Code Blue call was made for 36 cases (cardiac arrest and respiratory arrest). Since there is no separate emergency medical team for cases such as planned intubation, mechanical ventilator adjustment, and vascular access in critically ill patients, Code Blue call was made again.

Considering the time it took to reach the announcement area of the Code Blue team, the mean time to reach was 2.76±0.95 minutes. Out of the 127 Code Blue calls, to the 62 of them Anaesthesiology and Reanimation team went, and to the 60 of them emergency paramedic team went. The areas with the Code Blue are shown in **Table 2**, and the rates of the services called are indicated. It was determined that 4 of the calls (3.1%) were from places where Code Blue should not be called, such as coronary, thoracic, cardiovascular or internal medicine intensive care unit, and these codes were for patients who could not undergo endotracheal intubation during cardiac arrest.

Table 2. Code Blue Call Places

Code Blue location	n (%)
Inpatient Services (n:63 %49,7)	
Orthopedics	13 (%10,2)
Infectious Diseases	9 (%7,1)
Hematology-Oncology	8 (%6,3)
Pulmonology	8 (%6,3)
General Surgery	7 (%5,5)
Neurosurgery	4 (%3,1)
Gastroenterology-Rheumatology	3 (%2,4)
Eye diseases	3 (%2,4)
Neurology	2 (%1,6)
Gynecology and Obstetrics	2 (%1,6)
Cardiovascular Surgery	1 (%0,8)
Ear, nose, and throat	1 (%0,8)
Hemodialysis Unit	1 (%0,8)
Cardiology	1 (%0,8)
Intensive care	4 (%3,1)
Cases without hospitalization (n:60 %47,2)	
Polyclinics	53(%41,7)
Hospital Garden	7 (%5,5)

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The time distribution of the Code Blue call is shown in **Table 3**. It was determined that weekend night calls were statistically significantly higher than weekday night calls (p<0.001).

Table 3. Distribution of Code Blue announcements during weekdays and weekends during working and shift hours

	Weekday	Weekend	Total
08:00-16:00	93 (%86,9)	9 (%45)	**102 (%80,3)**
16:00-08:00	14 (%13,1)	11 (%55) *	**25 (%19,7)**
Total	**107 (%100)**	**20 (%100)**	**127 (%100)**

No statistically significant difference was found between day and night when the ROSC ratios of the patients who underwent CPR were examined.

Table 4. Characteristics of day-night and weekday-weekends with ROSC rates/results during CPR.

	CPR Result		
	ROSC n (%)	**Death n (%)**	**Total n (%)**
Night	5 (%38,5)	8 (%61,5)	**13 (%100)**
Daytime	10 (%43,5)	13 (%56,5)	**23(%100)**
Total	**15 (%100)**	**21 (%100)**	**36 (%100)**
Weekday	14 (%46,7)	16 (%53,3)	**30 (%100)**
Weekend	1 (%16,7)	5 (%83,3)	**6 (%100)**
Total	**15 (%41,7)**	**21 (58,3)**	**36 (%100)**

Of the 36 patients who underwent CPR, 30 (83.3%) underwent weekday CPR and 6 (16.7%) had weekend CPR. When the results of the patients who underwent CPR were examined, no statistical significance was found between weekdays and weekends (p= 0.174), **(Table 4)**. Of the 20 male patients who underwent cardiopulmonary resuscitation, 9 (45%) had spontaneous circulation, and 11 (55%) were considered to be exitus. Among 16 female patients who underwent CPR, 6 (37.5%) patients with spontaneous circulation and 10 (62.5%) patients who died were determined. When the CPR results of male and female subjects were examined, no statistical significance was found (p=0.650).

When the clinical conditions and additional diseases of the patients in the inpatient services and intensive care units to which the Code Blue was called were examined, it was observed that cardiovascular system diseases in 40 (71.4%) patients, renal system diseases in 20 (35.7%) patients, endocrine diseases in 19 (33.9%) patients were found to accompany. Other additional diseases consisted of cancers, muscle diseases, rheumatological system disorders, cerebral palsy and osteomyelitis.

The relation between cardiopulmonary resuscitation results and the first rhythm is presented in **Table 5**. In the first rhythm evaluation of the patients who underwent cardiopulmonary resuscitation, rhythms that were not applied shock were determined in 33 (91.7%) cases, and rhythms in which shock was applied in 3 (8.3%) cases **(Table 5)**. No statistical significance was found between the first rhythm evaluated and the result of CPR (p=0.760)

Table 5. Characteristics of CPR results and first rhythm

	CPR Results		
	ROSC n (%)	**Death n (%)**	**Total n (%)**
Shocked Rhythms	1 (%33,3)	2 (%66,7)	**3 (%100)**
Non-shocked Rhythms	14 (%42,4)	19 (%57,6)	**33 (%100)**
Total	**15 (%41,7)**	**21 (%58,3)**	**36 (%100)**

When the CPR time was examined for the cases whose spontaneous circulation returned, it was determined as 18.20±14.74 minutes. When the CPR time of the patients who died after cardiopulmonary resuscitation was examined, it was determined as 44.81±8.39 minutes.

When the CPR duration of the cases whose spontaneous circulation returned and the cases with death were examined, statistical significance was found (p<0.001).

When the duration of hospitalization before cardiac arrest in the patients who underwent cardiopulmonary resuscitation was examined, it was determined that the mean duration of hospitalization was 18.67±11.23 days in the patients with ROSC, and 17.52±14.85 days in the patients who were reported as death after CPR. There was no statistically significant difference in terms of hospitalization time among the patients who underwent cardiopulmonary resuscitation (p=0.046).

When the group of 36 (67.9%) patients that underwent cardiopulmonary resuscitation was evaluated (67.9%) it was determined that 4 (11.2%) patients were discharged. When 17 (32%) patients who underwent emergency/elective intubation without CPR and had Code Blue call for non-cardiac arrest reasons were evaluated, it was seen that 5 (29.5%) patients were discharged from the hospital. Eight of the patients who died had arrest during the intensive care follow-ups, and 4 of them had re-arrest in the service follow-ups until a place was available in the

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intensive care units, and they were recorded as `dead` as a result of CPR. We received no more Code Blue calls for these cases. When the patients who underwent cardiopulmonary resuscitation and those with respiratory arrest/critical endotracheal intubation indication were compared, no statistical significance could be determined when the discharge and death rates were examined (p=0.442) **(Table 6)**.

Table 6. Comparison of patients with and without CPR requirement in terms of discharge and death rates

	Discharge n (%)	Death n (%)	Total n (%)
CPR cases	4(%11,2)	32(%88,8)	**36(%100)**
Respiratory arrest and ETT indication	5(%29,5)	12(%70,5)	**17(%100)**
Total	**9(%17)**	**44(%83)**	**53 (%100)**

In 4 (11.2%) patients who underwent CPR due to cardiac arrest, GCS scores at discharge were 14±0.5, and SPS values 6 months later were 1.25±0.5. While 5 (29.5%) of the patients who were intubated due to respiratory arrest and underwent elective intubation **(Table 6)** were discharged, their GCS scores were 15 and SPS scores were 1.

DISCUSSION

In this study, the status of in-hospital code blue calls over a 9-month period was examined. Of the given Code Blue calls, 23 (19.2%) were cardiac arrest, 13 (10.8%) were respiratory arrest. All these calls were found to be in full compliance with the Code Blue code search criteria. Other calls are 'Code Blue ' calls, such as elective intubation of the critically ill patient, vascular access and mechanical ventilator adjustment, which are an indication to call an emergency medical team. Despite this, the mean time for the Code Blue team to reach the announcement area was 2.76±0.95 minutes.

The incidence of in-hospital cardiac arrest has been reported as follows in some studies conducted in recent years; between 2008 and 2017 in the USA, 292,000 or 9-10 out of 1000 hospitalizations per year had cardiac arrest.[7,8] In the United Kingdom in 2011-2013, cardiac arrest was reported 3.6 out of 1000 admissions.[9] In our hospital, a total of 58,875 hospitalizations were made during the 9-month period of the study, and when it is calculated according to the cardiac arrests which called for the Code Blue, a rate of 0.57 per 1000 patients is obtained. However, in our hospital, the number of cardiac arrests without a Code Blue call is unknown. Yet, it is thought that the reason for this could be the short length of the study and the inadequacy in keeping records.

In the light of the information obtained from a survey study with the participation of 180 people from various institution hospitals throughout Turkey, 97.6% of the hospitals have the Code Blue (2222) system for in-hospital cardiac arrests.

However, it was determined that this system was activated at a rate of 71.9%. [10] According to the results of another study conducted in our country, it was reported that in case of cardiac arrest and sudden deterioration in general condition, "2222" was dialled from the nearest phone available, and in the meantime, the information of the call and the place where the call was made was conveyed to the pagers of all the Code Blue team members.[11]

In many studies investigating Code Blue practices, it was determined that the majority of Code Blue calls were non-arrest calls, and this finding is in line with the results of other similar studies.[11,12] The vast majority of these non-arrest calls are false calls. In a study evaluating the effectiveness of emergency response teams, it was seen that only 30% of the calls were real arrest calls and met the Code Blue criteria.[12]

In our study, 19.2% of the Code Blue calls made after excluding false codes were cardiac arrest and 10.8% were respiratory arrest. It has been observed that the real emergency situations that will require Code Blue activation are compatible with the literature with a rate of approximately 30%.

The time between calling Code Blue and reaching the scene of the case is important. In the study conducted by Cooper [13], the success rate of patients whose resuscitation started within 3 minutes was found to be 44.5%, and this rate decreased to 19.5% in times longer than 3 minutes. 63% of the participants, who participated in a survey questioning their knowledge and thoughts about the practical applications made in their own institutions regarding the functioning of the current blue code system in Turkey, stated that the team's arrival time to the scene was approximately 24 minutes, 11% of the participants stated the time as 4-6 minutes and 18% of them stated it as 1 minute. [10] Murat et al.[14] In their study in which they reported the results of all Code Blue calls in Malatya State Hospital for 2 years, evaluated a total of 180 patients. The average time the team reaches the patient was reported as 2.72 minutes. The mean time to reach the scene of 196 Code Blue calls reported in another university hospital in our country has been reported as 1.61±1.72 minutes. When our Code Blue calls were examined, the mean time to reach the scene was found to be 2.76±0.95 minutes, and it was found to be similar to the times reported in the literature. It is an important factor that in our hospital there are two teams responsible for different areas and that the inpatient services are in the building where the anaesthesia team is located. In addition, it also saves time to make a call back on the way to the Code Blue scene to get to the exact location of the case.

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In the study of Schultz et al., poor prognosis criteria in in-hospital arrest cases were shown to be over 10 minutes of CPR, as well as being over 60 years old and comorbidities such as pneumonia, sepsis, kidney failure, and heart disease. [15]

According to data from the American Heart Association's Get With The Guidelines-Resuscitation-GWTG-R registries, the mean age of patients with in-hospital cardiac arrest in the United States is 66, with 58% male and first rhythm mostly (81%) reported a non-shocked rhythm (asystole or pulseless electrical activity)[8,16,17]

In our study, the mean age of patients with in-hospital cardiac arrest was 60.00±18.63 years. 52.9% of the patients were female and 47.1% were male. Male gender has been associated with lower survival rates in the literature.[18,19,20] In a recent study conducted in 2021, it was reported that there was no difference between gender and survival rate in 5306 in-hospital cardiac arrest cases, but the survival rate decreased by increasing age, and advanced age was a poor prognostic factor in survival. [21]

In our study, there was no relationship between ROSC and gender. In a study evaluating in-hospital cardiac arrests, the mean age of 23,554 cardiac arrests was 74 years and the ratio of men was 57.2%.

A decrease in the survival rate with increasing age has been shown in many previous studies.[18] Two different studies found significantly lower survival in patients over 80 years of age than younger ones and these studies reported that no patients older than 90 years survived. [22,23] In our study, the highest age was found to be 96. In a study comparing the adult and paediatric patient population, significantly higher survival rates from cardiac arrest to hospital discharge were reported in children than in adults.[24]

Murat et al.[14] In their study, found that the most frequent Code Blue call was made between the hours of 22.00-23.00. As a result of the implementation of the Code Blue, 53% of the patients died, 19% were referred to advanced life support, and 28% had improved general condition. According to the results of this study, the researchers underlined that Code Blue is associated with a significant improvement in the results of hospitalized patients and stated that Code Blue is an accurate and indispensable standard method in terms of hospital quality, medical ethics, legal responsibility and patient safety.

In a recent study conducted in 2021, it was reported that 5306 cardiac arrest cases were within working hours in 63.8% and 36.2% of them happened within shift hours. This difference was not statistically significant. It was determined that the rate of cardiac arrest was statistically significantly higher by 64% during the weekend night hours.[21]

In a recent study, 3422 cardiac arrest cases were examined and reported that 76% of cardiac arrests occurred on weekdays, but it was found that these researchers did not examine the difference between weekdays and weekends in their articles.[25]

In both studies, the difference in cardiac arrest frequency during weekends and working hours was not associated with survival.[21,25] In our study, it was determined that 86.9% of the Code Blue calls were made during the weekdays and working hours, but it was 55% more frequent at the weekends and at night. According to our results, it was determined that the weekend night calls were statistically significantly higher than the weekday night calls. Although it was determined that the return of spontaneous circulation was less in night time cardiac arrest cases with nocturnal return than in day time cases, this difference was not statistically significant.

It was observed that the results of CPR performed on weekdays and at the end of the week did not have a statistically significant relationship with survival. It is known that the first rhythm seen more frequently in in-hospital cardiac arrests is the non-shock rhythm.[9,18] Survival to hospital discharge is only 10% in patients with a non-shockable rhythm, compared with approximately 50% in patients with a shockable first rhythm.[8,9,25] Unfortunately, the proportion of patients with a shocked rhythm at the beginning is only 20%.[8,9,25]

In a study by Stankovic et al.[26] in which 2780 cardiac arrest results were analysed, the rate of ROSC was 80% in 639 patients whose first rhythm was shockable, and 41% in 2783 patients with non-shock rhythm. In hospital cardiac arrest patients, predictors of first shock rhythm included witnessed arrest and specific heart diseases in monitorized patients. Older age, female gender, and specific non-cardiovascular diseases were found to be predictors of baseline non-shock rhythm.

The initial rhythm being a shockable rhythm was strongly associated with ROSC and 30-day and one-year survival[25]. In another study; When the first rhythm in cardiac arrest was asystole and NEA, if the first rhythm was NEA, it was associated with higher ROSC, but there was no difference in long-term survival such as 30 days and one year.[26]

In the same study, the relationship between the first rhythm and additional diseases was evaluated and it was reported that there was no relationship between most of the comorbidities and the first cardiac arrest rhythm.

Pulmonary disease, obesity, and gastrointestinal cancer were associated with initial asystole, but ischemic heart disease and cardiac arrhythmias other than atrial fibrillation/flutter were associated with NEA. In our study, in the first rhythm evaluation of patients who underwent CPR, rhythms that were not shocked were determined in 33 (91.7%) cases, and shocked rhythms were determined in 3 (8.3%) cases. ROSC was detected in 33% of the cases with shock applied rhythm as the first rhythm. ROSC

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was observed in 42.4% of the patients who were evaluated as the rhythm without shock as the first rhythm, and CPR resulted in exitus in 57.6% of the cases.

There was no statistical significance between the first rhythm evaluated and the ROSC. The low rate of shockable rhythms suggested that Code Blue activations were delayed or rhythm recognition skills were insufficient.

When 36 patients who underwent cardiopulmonary resuscitation were evaluated in terms of additional diseases according to the results of CPR; no statistically significant difference could be determined between the patients whose spontaneous circulation returned and those who died in terms of additional diseases. When the CPR duration of the cases whose spontaneous circulation returned and the cases with death were examined, statistical significance was found. When the patients who underwent cardiopulmonary resuscitation were compared with those with an indication for endotracheal intubation due to critical illness, and the rates of discharge and death were examined, no statistical significance could be determined. It was determined that this result may vary according to the lack of an early warning system in our hospital. Also the approach to patients with worsened condition may vary in different wards. Parameters used for early warning systems such as heart rate, blood pressure, respiratory rate, and body temperature are monitored in nurse observation forms in the wards. However, we do not have any recorded data in which ward, which situation and how often the doctor was informed. In addition, it was thought that the number of patients who underwent CPR in our study was not sufficient to make a more detailed comment on this issue.

As a result of a meta-analysis in which Fernando et al[18] examined the prognostic factors in in-hospital cardiac arrests; they emphasized that short-term survival is generally considered as a result of CPR. However, the relationships between prognostic factors and neurological outcome at discharge or long-term survival are unknown. In some of the included studies, different scales were used when evaluating neurological outcomes, and therefore a meta-analysis could not be performed [18]. After successful CPR, it is aimed to have SPS scores of 1-2 in the later life of the patients. In our study, it is possible to evaluate the neurological status of patients who underwent CPR as successful CPR according to the GCS. However, due to the small number of cases and the lack of follow-up and recording of the ICU process, no comment can be made on practices other than Code Blue intervention that may affect CPR results, scores at discharge and the SPS scores after 6 months. Among the limitations of this study is that only a small number of patients were included and therefore cross-comparisons could not be made for all outcomes. In addition, the information about the period when the patients whose spontaneous circulation returned were followed in the wards or intensive care unit, the lack of treatment applied there, and the lack of data in long-term survival are among the limitations.

As a result, it is difficult to examine the effects of Code Blue applications, which is one of the medical emergency systems due to its multi-factorial nature, on patient outcomes, as it depends on many factors. In many studies related to rapid response teams, the most focused issue has been the early detection and treatment of conditions that have the potential to deteriorate the patient's condition and that may cause cardiac arrest, and the measures to be taken to reduce hospital deaths. Although significant improvements have been made in the call systems of Code Blue teams in hospitals and their rapid access to the scene, the use of early warning systems to reduce the need for these calls, the creation of a separate TAE team, the care and follow-up of critically ill patients can reduce hospital deaths. In order to reduce hospital deaths, regular in-house trainings should not be neglected.

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