



Evaluating the Code Blue Call System's Effectiveness at Balıkesir University Faculty of Medicine Hospital

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Abstract

Aim: Code blue is a code system that aims to increase the success of cardiopulmonary resuscitation (CPR) by intervening quickly and on-site in cases of cardiac arrest in hospitals today. In our study, code blue applications, reasons for the call, and interventions performed in Balıkesir University Hospital were analyzed retrospectively.

Material and Method: Code blue calls performed in 2020-2024 were retrospectively analyzed. In the study, demographic data, reasons for the call, units where the call was made, and data on the processes developed in patients undergoing CPR were analyzed.

Results: The data of 142 patients were included in the study. It was determined that 53.5% of the calls were male, the total number of applicants was between 17-95 years old, the mean age was 62.11 years old, and the highest number of calls was in the 60-69 age range (24.6%). The majority of calls were made between 11 and 12 a.m. (18.3%), and the majority were made on Mondays (21.8%) and Tuesdays (21.8%). It was observed that most of the calls were made in inpatient wards (n=69). 48 patients underwent CPR, and 30 patients were successfully resuscitated. Arrest was the most common reason for code blue 33.8% (n=48), syncope 20.4% (n=29), and hypotension 16.2% (n=23) were the other common complaints. It was observed that 39.4% of the code blue calls resulted in emergency observation, 28.2% were referred to the intensive care unit, and 19% were unfollowed up. The exitus rate was 12.7%.

Conclusion: A favorable outcome in code blue applications is possible only if the situations that may cause cardiac arrest are identified early and intervened and prevented, and this is of great importance. In this direction, it would be appropriate to provide regular trainings within the institution and to increase the competence of healthcare professionals in emergency intervention processes.

Keywords: Code blue, cardiopulmonary resuscitation, cardiac arrest

INTRODUCTION

Life-threatening situations are frequently encountered in hospitals. Cardiac arrest is an important problem affecting survival (1). Cardiac arrest is generally recognized as one of the major causes of in-hospital morbidity and mortality (2). The number of in-hospital cardiac arrests is reported as 200.000 cases per year. The survival rate after cardiac arrest varies between 11% and 35% (1). In Danish health data, a cardiac arrest value of 1.8 per 1000 hospitalized patients was reported between 2017 and 2018 (3). In Japan, the incidence of in-hospital cardiac arrest was reported as 5.1 per 1000 hospitalized patients in studies conducted between 2011 and 2017 (4).

It is stated that this difference may be due to different practices that may vary between institutions. Therefore, it is emphasized that studies to increase the rate of return after

cardiac arrest in hospitals should be obtained, and research in this field should be increased (1).

The "code blue" call application system has been established in hospitals worldwide and in Türkiye in order to provide rapid intervention to expected or unexpected cardiac arrest cases. This practice was first started in the United States of America in July 2000 and is the only international code in which the color blue is used in common (5). Code blue is a general emergency code that aims to reach the unit where the call is given as soon as possible in cases where emergency intervention is needed and to carry out the necessary intervention (5). The use of the code blue application in our country has been initiated within the scope of the Ministry of Health since 2008 (6). This process includes the creation and readiness of a team trained in code blue, effective use of the appropriate call system, preliminary preparations and precautions to be made until the team reaches the

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patient, planning of transport vehicles and time, making the necessary equipment available, effective intervention, post-intervention patient management, and medical record processes. The main purpose of code blue is to increase the patient's chance of survival through rapid and effective intervention. Thanks to the effective use of this system, it is thought that survival rates can be increased in cardiac arrest and similar emergencies (7).

The aim of this study was to determine the reasons for code blue calls in our hospital, call locations, and the intervention when the code blue team reached the called unit. It is aimed to emphasize the importance of maintaining awareness of the code blue application.

MATERIAL AND METHOD

This study was conducted by retrospectively analyzing the data of the patients for whom a code blue call was generated between January 2020 and December 2024. In this retrospective study, a total of 142 patients who were given code blue in our hospital and whose medical records could be accessed completely were included. Ethical approval was obtained from Balıkesir University Health Sciences Non-Interventional Research Ethics Committee on 17/12/2024 with decision number 2024/246.

Within the scope of this study, data were retrospectively collected from code blue forms that were filled out post-intervention and submitted to the hospital's quality unit. The recorded data included patient demographics, the department where the call occurred, reason and time of the call, response time, performed interventions, and the patient's post-intervention referral unit.

The code blue team at our institution consists of an emergency medicine assistant doctor and an anesthesia technician, assigned monthly. Calls are activated via extension 2222, and the team responds promptly, with the time to reach the scene documented accordingly.

Upon arrival, the team initiates cardiopulmonary resuscitation (CPR) and other emergency interventions following standard algorithms. The patient's primary care team supports the process by preparing essential equipment, including a monitor and defibrillator.

Following the intervention, a code blue form is completed, with one copy archived in the patient's file and another collected by the emergency team. These forms constituted the primary data source for this retrospective study.

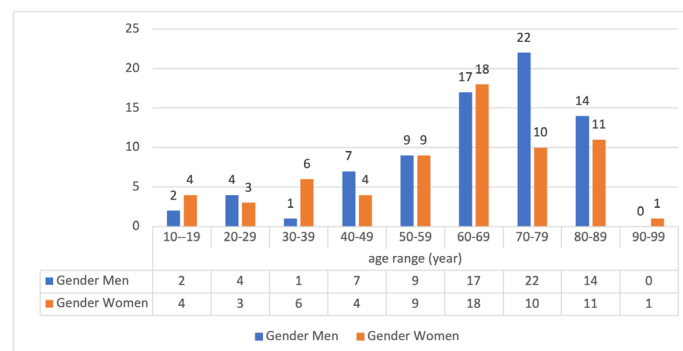
Statistical

Statistical analysis of the data was performed with the Statistical Package for the Social Sciences (SPSS) for Windows 24.0 package program. Numerical variables were presented with mean $\pm$ standard deviation and minimum-maximum values. Categorical variables were defined using frequency (n) and percentage values.

RESULTS

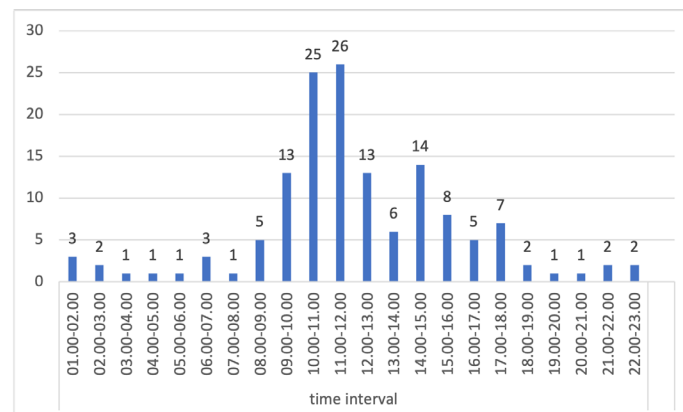
142 patients who were given code blue in our hospital and whose medical records could be accessed completely were included. When the age data of the patients were analyzed, it

was found that the patients were between the ages of 17 and 95. In the demographic data of the patients, the percentage of females was 46.5% (n=66), and the percentage of males was 53.5% (n=76). The mean age (years) was 62.11 years. The highest number of applications was in the 60-69 age range (24.6% (n=35), Graph 1).

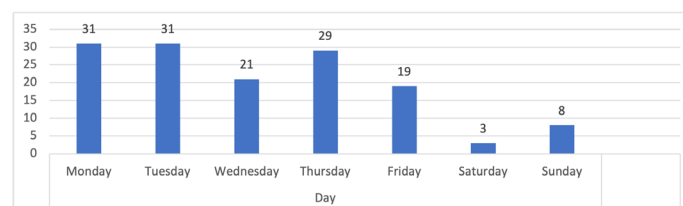


Graphic 1. Demographic characteristics

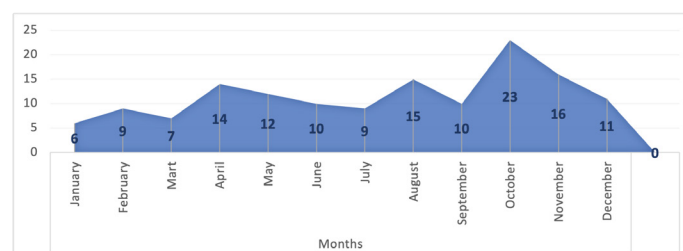
The majority of the code blue calls were made between 11 and 12 a.m. (18.3%) (n=26), 10 and 12 p.m. (17.6%) (n=25), and 14 and 15 p.m. (9%) (n=14), according to our analysis of the calls by time interval (Graph 2). When analyzed in terms of days, 31 calls were made with 21.8% on Mondays and 21.8% on Tuesdays (Graph 3). When the calls made by month are analyzed, it is seen that the most calls were made in October with 16.2% (n=23), November with 11.3% (n=16), and August with 10.6% (n=15) (Graph 4).



Graph 2. Distribution of calls according to hours



Graph 3. Distribution of calls according to days



Graph 4. Distribution of calls according to months

After accessing the code blue calls, cardiac massage was performed in 33.8% of the cases, and in 5.6% of the cases, a defibrillable rhythm was detected as a result of cardiac

massage and defibrillation was performed. In 40.8% of the cases, medication, including adrenaline, antihistamines, antiarrhythmics, dextrose, etc. were administered (Table 1).

Table 1. Applications to code blue calls

Application		n	%
CPR	Yes	48	33.8
	No	94	66.2
Defibrillation	Yes	8	5.6
	No	134	94.4
Drug	Yes	58	40.8
	No	84	59.2

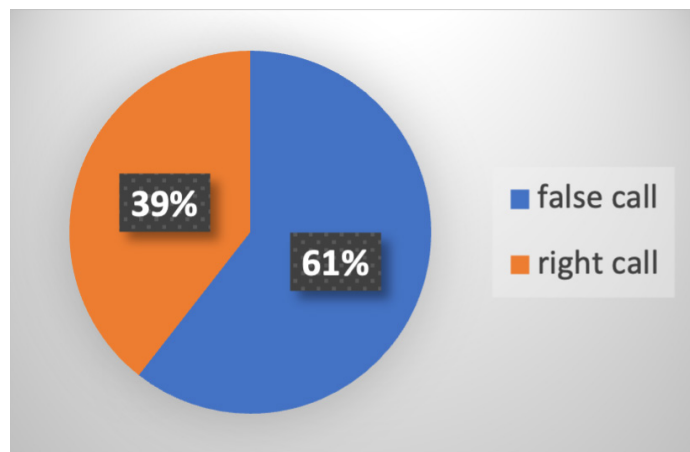
35.2% (n=50) of the 142 patients examined in the study were assessed in outpatient clinics, 16.2% (n=23) in other facilities, and 48.6% (n=69) in wards. The internal medicine service (n=17) received the most applications among the wards (12%), followed by the chest diseases service (n=14) with 9.9 % and the cardiology service (n=10) with 7%. The

ophthalmology outpatient clinic (n=15) had the highest intensity of outpatient clinic applications, followed by the neurology outpatient clinic (6.3%) (n=9) and the ear, nose, and throat outpatient clinic (3.5%) (n=5). In other units, the radiology unit (n=7) had 4.9% of applications, while the blood collection unit (n=11) had 7.7% (Table 2).

Table 2. Units given a code blue call

	Units	n	%
Service	Internal medicine service	17	12
	Infectious diseases service	1	0.7
	General surgery service	9	6.3
	Chest diseases service	14	9.9
	Eye diseases service	2	1.4
	Cardiology service	10	7
	Otolaryngology service	4	2.8
	Cardiovascular surgical diseases service	3	2.1
	Neurological diseases service	2	1.4
	Orthopedics and traumatology diseases service	2	1.4
	Urology diseases service	3	2.1
	Total	69	48.6
Policlinic	Anaesthesia polyclinic	1	0.7
	Neurosurgical diseases polyclinic	1	0.7
	Gynecology and obstetrics polyclinic	3	2.1
	Dermatology diseases polyclinic	1	0.7
	Physical therapy and rehabilitation polyclinic	2	1.4
	General surgery diseases polyclinic	1	0.7
	Eye diseases polyclinic	15	10.6
	Cardiology polyclinic	3	2.1
	Urology diseases polyclinic	1	0.7
	Otolaryngology polyclinic	5	3.5
	Orthopedics and traumatology diseases polyclinic	2	1.4
	Cardiovascular surgical diseases polyclinic	3	2.1
	Neurology diseases polyclinic	9	6.3
	Plastic surgery polyclinic	1	0.7
	Psychiatric diseases polyclinic	2	1.4
	Total	50	35.2
Other	Dialysis	3	2.1
	Endoscopy	1	0.7
	Radiology unit	7	4.9
	Blood collection	11	7.7
	Dining	1	0.7
	Total	23	16.2

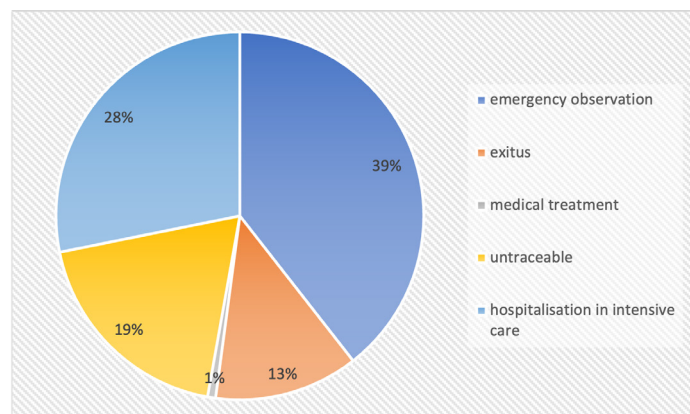
Of the calls made, 56 were appropriate and 86 were inappropriate code blue calls (Graph 5).



Graph 5. Appropriateness of code blue calls

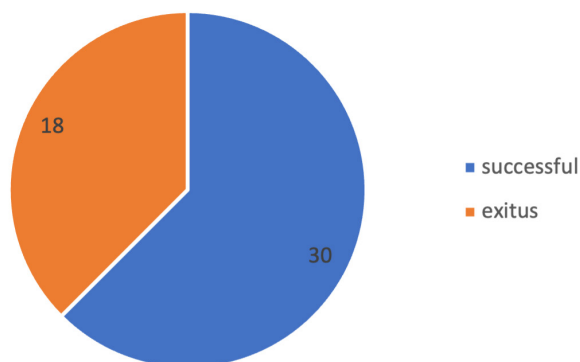
Among the code blue reasons, arrest was the most common reason 33.8% (n=48), while syncope 20.4% (n=29) and hypotension 16.2% (n=23) were the other frequent call complaints. In 25 calls (17.6%), the calls made were considered as wrong calls (Table 3).

When the results of code blue calls were analyzed, it was observed that 39% were taken into emergency observation, 28% were referred to the intensive care unit, and 19% were unfollowed up. The rate resulting in exitus was 13% (Graph 6).



Graph 6. Finalization of code blue calls

In the cardiopulmonary resuscitations performed after the code blue call, it was observed that 30 (62.5%) of the CPRs performed on 48 patients were successful, and a response was obtained (Graph 7).



Graph 7. Outcome of cardiopulmonary resuscitation

DISCUSSION

In-hospital response systems to cardiac arrests differ across institutions. While some centers activate code blue teams exclusively for cardiac arrests, others utilize these teams more broadly for patients with deteriorating clinical conditions (8). In a study conducted in Turkey, almost all of the hospitals (97.6%) have a Code Blue call system for responding to in-hospital cardiac arrest cases (9).

In our study, when the gender distribution of the cases with code blue calls was evaluated, male patients were in the majority. In a study, the rate of male patients in blue code calls was similar to our study (10). In another study, 44.8% of the cases were female and 55.2% were male patients, similar to our study (11).

The 60–69 age group accounted for the highest proportion of cases at 24.6% (n=35). This may reflect increased healthcare utilization and a higher burden of chronic diseases in this age range, suggesting the need for targeted clinical attention.

In our study, in-hospital code blue calls that occurred in our hospital during the last 5 years were analyzed retrospectively. Of the total number of code blue calls, 86 were recorded as inappropriate calls. The most common cause of the 142 calls was arrest (33.8%), followed by syncope (20.4%).

When the code blue calls in outpatient clinics were analyzed, it was observed that they were generally given during the outpatient examination of ophthalmology and neurology diseases. Sudden syncope and hypotension that may occur in local procedures performed on patients in ophthalmology outpatient clinics may explain the creation of a call for code blue.

Advanced age is associated with increased comorbidities and a higher risk of events such as hypotension, hypoglycemia, or cardiac arrest, particularly during prolonged waiting periods in outpatient settings. In the blood collection unit, fasting patients may experience syncope or hypotension, potentially triggering code blue calls. Similarly, in the radiology unit, anxiety-related reactions like panic attacks may lead to misinterpretation by staff and inappropriate code blue activations.

Analysis of code blue calls by time revealed a concentration between 9:00 and 12:00 a.m., possibly related to symptoms arising during morning queues in outpatient clinics or in the blood collection unit.

Most code blue activations occurred in inpatient wards. As a tertiary university hospital, our institution admits complex cases from across the region. While hospitalized patients may initially appear stable, clinical deterioration during follow-up is common, particularly in wards such as internal medicine, pulmonology, and cardiology, where elderly patients with multiple comorbidities are typically managed. In their study, Özbilgin et al. reported that the highest number of code blue calls occurred in orthopaedics and general surgery wards (7).

According to the findings of the American Heart Association, it has been reported that the first rhythm evaluated in cases of in-hospital cardiac arrest in the United States of America is usually (81%) non-shock rhythms (12). In the studies conducted, it has been determined that the rhythm generally seen in cases of in-hospital cardiac arrest is non-shock rhythms. In our study, non-shock rhythm was observed in arrest cases and was found to be compatible with the literature. However, the survival rate is higher when rhythms are recognized and shock is applied (3). In our study, it was stated that 5 of the 8 patients who were shocked returned to normal rhythm. Özbilgin et al. also reported in their study that spontaneous circulation was restored in 21 of 29 patients with cardiac arrest who were observed to be in shockable rhythm, which is consistent with the literature⁷. Due to the higher survival rates in shockable rhythms, early monitoring and early defibrillation are of great importance. Studies have shown that each 1-minute delay in defibrillation increases the mortality rate (7).

Early recognition of clinical deterioration, prompt identification of shockable rhythms, and timely defibrillation are key to improving survival. High-quality chest compressions throughout CPR remain essential for successful outcomes. The absence of medication administration in 59.2% of cases suggests that many patients were stable and may not have required a true code blue activation.

In the studies in which code blue applications were analyzed, it was determined that the majority of the code blue calls were those in which arrest did not occur. This shows that the code blue system is frequently used not only in cardiac arrest cases but also in other clinical situations requiring emergency intervention (13). In our study, it was observed that the majority of the calls were for non-arrest reasons (66.2%) in accordance with the literature. In outpatient clinics, it is thought that healthcare professionals call code blue immediately, whether it is syncope, hypotension, or hypoglycemia. However, if a short neurological examination and blood pressure and glucose results are checked before the call, it will be seen that code blue calls are given more appropriately. In various studies conducted in our country, in the study conducted in Malatya State Hospital, the rate of false calls in code blue notification was reported as 10%, while it was found to be 18% in Arnavutköy State Hospital and 4% in Çarşamba State Hospital. These rates emphasize that the way the code blue system is used may differ between hospitals and the importance of training and protocols to prevent false calls (14). In our study, the false call rate was 17.6%. This percentage is explained by the fact that healthcare workers accidentally pressed the code blue button or did not perform the first intervention on the patient and immediately gave code blue. If the approach to the unstable patient and arrest management is spread to all units of the hospital more frequently, both the number of false calls will decrease and the calls for non-arrest cases will decrease.

These trainings will contribute to increasing survival rates by shortening the intervention time to the patient. Studies

show that in 66.3% of healthcare organizations in Türkiye, code blue training is provided to teams continuously and at regular intervals. This situation emphasizes the importance of regular training to increase the effectiveness of code blue applications and reduce false call rates (9).

Following code blue calls, 39% of patients were monitored in the emergency observation area, 28% were referred to intensive care, and 19% had no subsequent follow-up. Observation cases were likely related to transient symptoms such as syncope, hypotension, or hypoglycemia, particularly among fasting outpatients. Intensive care admissions likely included patients who clinically deteriorated in the wards, some requiring intubation or resuscitation. Cases with no follow-up were predominantly stable patients, suggesting that the code blue may have been triggered inappropriately.

CONCLUSION

This study revealed that code blue calls vary significantly by time, age, and demographic characteristics. Increased call frequency was noted during early mornings, the beginning of the week, in older patients, and during seasonal transitions. These findings suggest that optimizing in-hospital monitoring, staff allocation, early warning systems, and training during these high-risk periods could enhance patient safety and the effectiveness of code blue responses.

Effective code blue implementation enables rapid recognition and timely intervention in in-hospital cardiac arrests. Identifying underlying causes, improving arrest detection, institutional planning, and regular staff training are key components that can enhance survival outcomes.

This content has some limitations. The first is the small number of patients included. There are significant shortcomings in the lack of long-term survival data.

It was observed that the studies were generally performed by anesthesia physicians. Evaluating code blue calls from the perspective of emergency medicine physicians will make a positive contribution to the literature.

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Conflict of interest: The authors have no conflicts of interest to declare.

Ethical approval: Ethical approval was obtained from Balıkesir University Health Sciences Non-Interventional Research Ethics Committee on 17/12/2024 with decision number 2024/246.

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