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Evaluation of Cardiopulmonary Resuscitation Conditions in Turkey: Current Status of Code Blue

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Abstract

Objective: Globally, previously determined teams activated by 'code blue' calls target rapid and organised responses to medical emergency situations. This study aimed to evaluate the cardiopulmonary resuscitation (CPR) conditions in Turkey.

Methods: A web-based survey was sent to anaesthesiologists in Turkey via email. The survey included 36 questions about demographic features and 'code blue' practices and procedures.

Results: A total of 180 participants were included. The mean working duration was 16.1±7.5 years. Of the anaesthesiologists who participated, 35% worked in university, 26.1% in education and research, 1.7% in city hospitals, 18.9% in state hospitals and 18.3% in private hospitals; 68.3% had CPR certification. There were code blue systems in 97.6% of the organisations. For code blue calls, 71.9% were activated by calling '2222'. There were 41.5% organisations with code blue teams of 3–4 people, whereas 26.7% had 2-member teams. Among call responders, 68.5% were anaesthesia technicians/paramedics, 60.7% were anaesthesiologists and 42.7% were anaesthesia assistants. In organisations, 66.3% regularly conducted code blue training. In total, 63.3% of the participants stated that the time to reach the location was nearly 2–4 minutes. During CPR, the use of capnography was 18.3%. Of the participants, 73.8% chose endotracheal intubation as priority airway device during CPR.

Conclusion: Today, code blue practice is an important quality criterion for hospitals. This study shows the current status of 'code blue' according to the results of respondent data completing the survey. To prevent in-hospital cardiac arrest, a chain of preventive measures should be established, including personnel training, monitoring of patients, recognition of patient deterioration, the presence of a call for help system and effective intervention.

Keywords: Cardiopulmonary resuscitation, code blue, in-hospital cardiac arrest

Introduction

The mean frequency of in-hospital cardiac arrests is 200,000 per year, with survival after cardiac arrest varying from 11% to 35% (1, 2). This significant difference in rates is thought to be because of implementations varying from hospital to hospital. Therefore, there is a need to increase the studies obtaining scientific data about increasing survival rates after in-hospital cardiac arrests.

In some countries, there are separate teams to assess patients with worsening general status to prevent the development of cardiac arrest and to intervene with cardiac arrest cases. In other countries, there is no such dis-

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tinction. These implementation practices may vary country wise as well as from hospital to hospital. However, every hospital should have cardiac arrest intervention instructions appropriate to their conditions and the regulations of the country.

The call system known as 'code blue' worldwide based on the principle of activating a call announcement system with a standard number (2222) is the most commonly used system in Turkey and is another example of the rapid intervention teams mentioned earlier.

This study aimed to assess the cardiopulmonary resuscitation (CPR) conditions for in-hospital cardiac arrests.

Methods

This study was a cross-sectional survey study. It was performed after receiving permission from the Manisa Celal Bayar University non-interventional ethics committee (approval #: 20.478.486). The study was conducted by sending a web-based survey via email to clinicians employed in health organisations in Turkey who were members of the Turkish Society of Anaesthesiology and Reanimation (containing 36 questions in Appendix 1). Participation in the survey was not mandatory. The survey form was sent to the clinicians 3 times over 4 weeks from 24th to 31st August 2018.

The survey form was organised as a questionnaire about demographic characteristics, organisation of employment, call system for in-hospital cardiac arrests, practical applications in their organisation related to CPR and relevant knowledge and thoughts. Some questions on the survey were prepared to allow for more than one answer to be selected.

Statistical analysis

Data obtained from the responses on the survey were analysed using the Statistical Package for the Social Sciences for Windows 15.0 version program (SPSS Inc., Chicago, IL, USA). Data were presented as mean±standard deviation, and frequency data were presented as numbers and percentages.

Main Points:

- Prompt delivery of high-quality CPR can dramatically improve survival outcomes.
- Code blue system is to provide a rapid and organised response to medical emergency situations by dedicated team.
- Code blue activated with a standard number which is 2222 in many countries on the world.
- Every hospital should have cardiac arrest intervention instructions appropriate to their conditions and the regulations of the country.

Results

The survey prepared for the study was sent by email to a total of 2,100 people. The responses from a total of 180 people who answered the survey questions were analysed. The mean age of participants was determined as 44.2±7.3 years. The female to male participants ratio was 53.9% to 46.1%. The participants had a mean professional employment duration of 16.1±7.5 years. The distribution of organisations of employment were 35%, university; 26.1%, education and research; 1.7%, city hospitals; 18.9%, state hospitals and 18.3%, private hospitals. The distribution in terms of participant titles was 61.1%, specialist doctor; 16.1%, lecturer doctor; 12.8%, professor doctor and 10%, associate professor doctor.

The distribution of organisations of employment and provinces for clinicians participating in our study is given in Table 1. The top 5 provinces were determined to be large provinces, including İstanbul, İzmir, Ankara, Bursa and Konya.

Of the participants, 68.3% stated they had CPR certification; the duration since the certificates were received was ≤5 years for 29.4%, 6–10 years for 21.7% and 11–20 years for 17.2% participants.

In the organisations of employment, 97.6% participants had the code blue system. It was determined that 71.9% of code blue calls were activated by calling '2222'. Others stated that there was another number used within the hospital (Table 2 and Figure 1).

For the number of people in the code blue team, 26.7% participants stated there were at least 1–2 people, 41.5% stated there were at least 3–4 people, 20.5% stated there were at least 5–6 people, 5.2% stated there were 7 or more people and 6.1% did not know. Among those attending calls, 68.5% were identified to be anaesthesia technicians/paramedics, 60.7% were anaesthesia specialists and 42.7% were anaesthesia assistants. The code blue team leaders were anaesthesia specialists as stated by 87.5% and not anaesthesia specialists by 10.2% participants; 2.3% stated they did not know the code blue team leader in their organisation. Among the participants, 63.3% stated that the time for the team to reach the event site was nearly 2–4 minutes, 11.1% stated it to be 4–6 minutes and 18.3% stated it as 1 minute.

In answer to the question, 'who gives the news of death for patients who are exitus at the end of a code blue call?', 66.7% (120 participants) stated the answer as the doctor in charge of the clinic, 15% (27 participants) stated the code blue team leader, 0.6% (1 participant) said a nurse and 5.5% (10 participants) did not know. A total of 22 people (12.2%) stated that it was performed by the code blue team leader along with the primary doctor responsible for the clinic.

Table 1. Distribution of participants according to organisation province

Province	Number of participants
Adana	7
Adıyaman	1
Antalya	1
Ankara	22
Aydın	2
Artvin	1
Balıkesir	1
Bingöl	1
Bursa	13
Bolu	1
Çorum	2
Denizli	3
Diyarbakır	2
Edirne	1
Eskişehir	2
Gaziantep	2
Hatay	1
Isparta	1
İstanbul	29
İzmir	27
Kayseri	4
Kahramanmaraş	2
Kırşehir	1
Kırklareli	1
Kütahya	1
Kocaeli	3
Konya	12
Malatya	4
Manisa	3
Mersin	5
Muğla	1
Ordu	2
Samsun	4
Şırnak	1
Trabzon	3
Tekirdağ	2
Tunceli	3
Tokat	1
Van	3
Yozgat	2
Zonguldak	2

The survey revealed that code blue training was regularly updated in 66.3% of the organisations. Apart from the code blue team, 82.8% of the health employees stated that their own organisations provided code blue training. It was stated that 32.8% participants performed unannounced code blue drills. There were standard CPR forms used at a rate of 60.6%. The ward equipment information for emergency situations in organisations is given in Table 3. For the defibrillator types used in the organisations, 87.2% of participants stated that they were biphasic, whereas 17.2% stated they were monophasic.

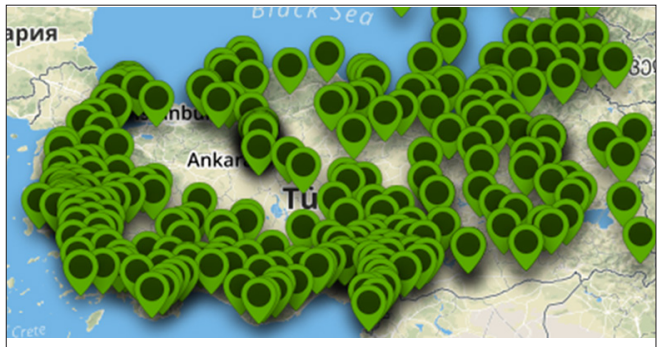


Figure 1. Distribution of provinces using the code blue in Turkey

During CPR, the rate for capnography use was 18.3% and that for the use of a mechanical compression device for chest compression was 9.4%.

Among the participants, 73.8% stated that the priority airway device chosen during CPR was endotracheal intubation. The balloon mask ventilation rate was 26.1%. The rate of performing therapeutic hypothermia after cardiac arrest was 40.6%. During CPR, 27.8% stated intra-osseous needles were used.

To answer the question, 'does your organisation have patients with do not resuscitate (DNR) orders?', 43.3% answered 'yes', 38.9% answered 'no' and 17.8% said 'I did not know'.

Discussion

According to the results of this study, the code blue system is found at 97.6% organisations in Turkey. It was determined that 71.9% of the code blue calls were activated by calling '2222'. There were intervention teams and trigger and follow-up systems for cardiopulmonary arrests occurring in the hospital. The intervention teams were multidisciplinary teams created to intervene with the case at the event site to increase the resuscitation efficacy. The trigger and follow-up systems are known as 'critical care outreach service' in England, 'medical emergency team' in Australia and 'rapid response team' in the United States (3). The call system known as 'code blue' worldwide and based on the principle of activation by a call announce system with the standard number

Table 2. Evaluation of code blue knowledge

		Number	%
Code blue	Yes	176	97.6
	No	1	0.6
	I don't know	3	1.7
Code blue activation number	2222	123	71.9
	112	8	4.7
	In-hospital intensive care phone number	7	4.1
	In-hospital emergency service phone number	6	3.5
	I don't know	10	5.8
	Other (pager)	17	10
Team members	Anaesthesia technicians/paramedics	122	68.5
	Anaesthesia specialists	108	60.7
	Nurse	81	45.5
	Anaesthesia assistant	76	42.7
	Doctors from other departments	72	40.4
	Security guards	59	33.1
	I don't know	3	1.7
Team leader	Anaesthesia specialist	155	87.6
	Not anaesthesia specialist	18	10.2
	I don't know	4	2.3

Table 3. Assessment of ward equipment knowledge for emergency situations in organisations

Equipment knowledge		Number	%
Is there an emergency cart for CPR in the wards?	Yes	166	92.2
	No	11	6.1
	I don't know	3	1.6
Do these carts have standard equipment?	Yes	129	71.6
	No	38	21.1
	I don't know	12	6.6
Is there a defibrillator in all wards?	Yes	137	76.1
	No	26	14.4
	I don't know	17	9.4
Is there an emergency bag for the code blue team to t ake to places outside of hospital wards?	Yes	160	88.8
	No	13	7.2
	I don't know	7	3.8

(2222) is the most commonly used system in Turkey and is another example of the rapid intervention teams mentioned earlier. The European Society for Anaesthesiology created a mapping plan with the aim of popularising the use of this fixed number for patient safety in countries worldwide and to determine the countries where it is used. Turkey is included on this map (4).

The aim of the code blue system is to provide a rapid and organised response to medical emergency situations by dedicated teams. The patient's age, comorbidities, physical conditions at the site of the arrest, cardiac rhythm, skills of the rescuer and a witness noting the time of arrest are important in terms of resuscitation success (5). All these include the basic dynamics in implementing the code blue. In Turkey, there is a need for more studies to ensure the general efficacy and optimal implementation of code blue teams (6). Generally, the aim of code blue implementations is effective and rapid intervention with correct code applications to ensure increased survival rates.

The implementation first began in the United States of America, and the blue colour is the only code in common use among international colour code applications (7). Widespread use of code blue began in our country with service quality standards after 2008 (8). The implementation was made mandatory in hospitals according to an official statement by the Ministry of Health in 2009 and the 'patient and employee safety regulation' published in 2011 (9). In addition, the implementation was included among the hospital service quality standards within the scope of the health performance and quality directive numbered 9489 in 2011 by the Ministry of Health and was subjected to evaluation. With the development of national terminology and generalisation of the implementation, the Ministry of Health found it appropriate to use and adopt the number 2222 as telephone activation call system. The same number is used in Europe in general, and Turkey was among the first countries to begin the implementation. This topic is found in the code blue directive of the Ministry of Health (General Directorate of Public Hospitals-Number: 443 73831319/319).

The organisation of the implementation, inclusion of many interconnected complicated processes, high risk to life of patients and requirements for professional approach and short-time management are important to reduce delays and possibility of mistakes. As the implementation is relatively new in Turkey, it is important to include all the available scientific data (10). The study results only cross-sectionally show the code blue implementation in our country and the conditions in organisations about in-hospital cardiac arrests. There are not many studies about this topic in Turkey. Therefore, this study provides valuable cross-sectional data about code blue implementations.

The number of clinicians who stated that the code blue team included at least 2 members was 62%. However, the number of people required to ensure optimal performance of the code blue team is 5–6 people or even more. According to our study results, the percentage of participants who knew that code blue teams included 5–6 members was 20.5%. The target for the team members is to perform high-quality CPR by sharing duties, such as compression, monitoring/defibrillation, airway, venous access, keeping records and acting as team leader. It is important that the team members know their responsibilities during CPR (11). Considering that the basic point of code blue operation is to work as a team, the current organisational conditions should be improved by increasing the number of code blue team members and creating operating algorithms that clearly and openly define duties within the team.

It was identified that those attending code blue calls were anaesthesia technicians/paramedics (68.5%), anaesthesia specialists (60.7%) and anaesthesia assistants (42.7%). According to the study results, 87.6% of code blue team leaders were anaesthesia specialists. The duration for the code blue team to reach the event location was 2–4 minutes according to 63.3%, 4–6 minutes according to 11.1% and 1 minute according to 18.3% participants. Of the participants, 92.7% said that the code blue team reached the event site in the first 3–4 minutes, defined as the 'golden minutes' during CPR, and this shows the success of the code blue system if we evaluate the analysis results according to the responding hospitals.

Murat et al. (10) have evaluated all code blue call outcomes for 180 patients over a 2-year period. They found that the mean time for the team to reach the site was 2.72 minutes and that the time when most code blue calls occurred was 22:00–23:00 hours. It was found that 53% of patients died, 19% were transferred to intensive care units and 28% had amelioration of general status. According to these study results, it was underlined that code blue implementations were associated with significant improvements in outcomes for inpatients, and they stated that code blue was an accurate and indispensable standard method in terms of hospital quality, medical ethics, legal responsibilities and patient safety.

In a university hospital, a broad scope (including all campus areas outside the hospital) code blue implementation was identified to have a 20% rate of survival at the end of the first 2 years (12). In this study, there were 5 code blue teams of 3 people each, including a clinician, a nurse or paramedic and assisting service personnel. The clinicians included in the teams were chosen from among research assistants in emergency medicine, anaesthesiology, paediatric health and diseases, internal disease and cardiology branches. The assisting service personnel in each team ensured that a code blue bag containing the necessary medications, materials and devices (mobile oxygen tube and biphasic defibrillators) and a defibrillator were brought to the event location. In situations with arrest or sudden and severe worsening of a person's general status, '2222' was called from the nearest telephone. At this point, the call and site of the call were sent to all 3 team members with call devices.

In-hospital cardiac arrests require knowledge on how to activate the code blue team and which number to use during CPR, along with the knowledge of where automatic external defibrillators are located in organisations. It is important to teach the initiation of CPR and activation of a call system for a patient with worsening general status or collapse and to question the benefit and permanence of any training given. In-service training should be performed and regularly repeated at certain intervals for it to be effective. In Turkey, the study results showed that the code blue training was regularly conducted at 66.3% of the organisations surveyed. Apart from

the code blue team, 82.8% of health employees stated that their own organisation provided code blue training. The need to perform unannounced code blue drills during the year is stated in the hospital quality standards. It was stated that unannounced drills for code blue were performed at 32.8% of organisations.

According to the results of this study, although 60.6% of organisations were reported to have a standard CPR form, 95% stated that they requested a standard CPR form for Turkey in general. A standard CPR form and recording of data on this form on a single countrywide database should be among the first targeted aims.

During CPR, the rate of capnography use was 18.3% and that of mechanical compression devices for chest compressions was 9.4%. The necessity to use capnography especially during CPR was included in detail in the 2015 guidelines from the European Resuscitation Council (13). Although this low rate may be related to the financial capability of each organisation, we think that it is necessary to increase the knowledge and awareness about this topic among all clinicians. The use of capnography during CPR will increase both the quality of and survival rates after CPR (13).

Of the participants, 73.8% reported that the priority airway device chosen during CPR was endotracheal intubation. The balloon mask ventilation rate was 26.1%. These study results show that the supraglottic airway devices are not chosen for airway management during CPR for in-hospital cardiac arrests. This result may be related to the code blue team leaders being anaesthesia clinicians and who have practiced endotracheal intubation.

The survey results showed that emergency carts in hospitals definitely included a defibrillator for use during CPR, and most defibrillators were biphasic.

It was stated that targeted termperature management implementation rates after cardiac arrest were 40.6%. A part of comprehensive critical care and temperature management targeting temperatures from 32°C to 36°C is beneficial for patients with spontaneous circulation returning after cardiac arrest. Patients with targeted temperature treatment after resuscitation are known to have reduced complications, unwanted events and reduced neurological injury in post-cardiac arrest syndrome (14, 15).

According to the results of this study, the reason for this rate being below 50% may be problems related to obtaining supplies required for use in targeted temperature treatment, available equipment and facilities in organisations. There is a need for advanced studies to discuss this in more detail.

One of the questions included in the survey was about the frequency of intra-osseous needle use during CPR, the answer to which was 27.8%. The intra-osseous infusion vascular route was defined nearly 100 years ago, and its use in adult resuscitation has increased, especially in the past 10 years. This could be owing to the increased number of studies related to the safe use of the intra-osseous route and the number and variety of intra-osseous devices supported by scientific data with the development of technology. If an intravenous route cannot be found or accessed in the first 2 minutes of resuscitation, intra-osseous intervention is recommended (13).

The question, "does your organisation have patients with a DNR order during CPR implementation?" was answered as 'yes' by 43.3%, 'no' by 38.9% and 'I don't know' by 18.8% participants. The DNR order generally means that CPR and advanced cardiac life support should not be performed. Diagnostically, the DNR order involves intubation or CPR; however, it does not require cessation of chemotherapy, antibiotherapy, dialysis and similar treatments. As a result, the generally accepted approach is that the DNR order process has not gained legal traction as it does not include the patient's authorisation instructions (forward-looking instructions, detailed instructions and medical will). In Turkey, the DNR order is still not legal (16). There are a variety of startling results from locations with the DNR concept in practical application worldwide. According to a study in Japan, although the DNR application rate was 90% when necessary, the habit of receiving written consent remained at 30% (17). Another study has found that more than 90% of clinicians believed that it was necessary and that more than 60% applied DNR, whereas 78% did not deem it necessary to consult with the patient and relatives. They concluded that although the DNR order was not appropriate to the country's traditions, there was a need to prepare directives to bring clarity to the topic (18). In Turkey, health employees encounter a severe ethical dilemma in daily practice in terms of the DNR concept. Organisations and specialists displaying courage in discussions related to this topic will be important in terms of resolving this dilemma among the health employees. Providing DNR orders within an international framework and specialising at national and even organisational levels will form the basis for preparing a DNR order form (16).

This study has some limitations, one of which is the low number of participants responding to the survey. Another limitation was that as with all survey studies, there was a possibility of people from the same organisation responding.

Conclusion

Currently, code blue implementations have become an important quality criterion for hospitals. This study showed the

current status of code blue implementation according to the information obtained by analysing data from participants who responded to the survey. There is a need for epidemiological studies or studies with more participants to collect information about Turkey in general on this topic. The rate of having a code blue system was 97.6%. The implementation process encompasses creation of a professional team, being on call, mobile, a technological call system, preliminary preparations and precautions until the team reaches the patient, access to devices and time, ready equipment, effective intervention, management after intervention and keeping records. Prevention of in-hospital cardiac arrest should include a prevention chain including personnel training, patient observation, awareness of disrupted status in a patient, a call system and effective intervention.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Manisa Celal Bayar Faculty of Medicine (Approved Number: 20.478.486).

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