Original Article / Orijinal Araştırma

Evaluation of First Rescuer Interventions on Arrested Patients in In-patient and Out-patient Hospital Clinical Services: Observations of Anesthesia Technicians on Duty in the Code Blue Team

Hastanelerin Yataklı Servis ve Ayaktan Kliniklerinde Arrest Hastalara ilk Kurtarıcılar Tarafından Yapılan Müdahalelerinin Değerlendirilmesi: Mavi Kod Ekibinde Görev Yapan Anestezi Teknisyen/Teknikerlerinin Gözlemleri

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Abstract

Aim: The aim of this study was to investigate the observations and experiences of anesthesia technicians working in the Blue Code Team (BCT) regarding the interventions performed by the first rescuers in Blue Code (BC) calls and to identify their shortcomings.

Material and Method: Our study is a descriptive and cross-sectional study. The population of our study consisted of anesthesia technicians on BC calls in Turkey. The online questionnaire form included 44 questions, 9 of which were socio-demographic questions. Data were collected through social media and email between 01/02/2023 and 01/04/2023. The total number of anesthesia technicians in Turkey was found to be 382 with a margin of error of 0.05 at 95% confidence interval.

Results: The total number of anesthesia technicians in Turkey was found to be 382 with a margin of error of 0.05 at the 95% confidence interval. A total of 568 technicians were reached. The mean age of the participants was 27 ± 6.64 years. 72.9% of the participants were female, 63.0% were single, 59.7% had 0-4 years of work experience. It was found that 16.2% of the participants had no advanced life support training. Almost all responses to the questionnaire were found to have a high rate of deficiencies or errors. Particularly noteworthy parameters were that BC was given on "Monday" (74.6%), most BC was given in "internal medicine wards" (57.4%) and "no patient intervention" (10.0%), although low.

Conclusions: In this study, anesthesia technicians working in BCT were found to have a lack of training in advanced life support, there were deficiencies in the interventions performed by the first rescuers and some interventions were not performed. It is noteworthy that no procedures were initiated to intervene on patients. The frequent requests for BC from internal wards should be investigated in detail. In this way, many BC procedures can be terminated more successfully or the occurrence of BC can be prevented.

Keywords: Anesthesia technicians, blue code, cardiopulmonary arrest, first responder

Öz

Amaç: Bu çalışmanın amacı Mavi Kod Ekibinde (MKE) görev yapan anestezi teknisyen/teknikerlerinin Mavi Kod (MK) çağrılarında ilk kurtarıcıların yaptığı müdahalelere ilişkin gözlem ve deneyimlerini araştırmak ve eksikliklerini tespit etmektir.

Gereç ve Yöntem: Çalışmamız tanımlayıcı ve kesitsel bir çalışmadır. Çalışmamızın evrenini Türkiye'de MK çağrılarına katılan anestezi teknisyen/teknikerleri oluşturmuştur. Çevrimiçi anket formunda 9'u sosyo-demografik olmak üzere 44 soru yer aldı. Veriler 01/02/2023 ile 01/04/2023 tarihleri arasında sosyal medya ve e-posta yoluyla toplanmıştır. Türkiye'deki toplam anestezi teknisyeni/teknikeri sayısı %95 güven aralığında 0,05 hata payı ile 382 olarak bulundu.

Bulgular: Türkiye'deki toplam anestezi teknisyeni/teknikeri sayısı %95 güven aralığında 0,05 hata payı ile 382 olarak bulundu. Toplam 568 teknisyene ulaşıldı. Katılımcıların yaş ortalaması 27 ± 6,64 yıldı. Katılımcıların %72,9'u kadın, %63,0'ı bekar, %59,7'si 0-4 yıl arası iş tecrübesine sahipti. Katılımcıların %16,2'sinin ileri yaşam desteği eğitimi almadığı belirlendi. Ankete verilen yanıtların neredeyse tamamında yüksek oranda eksiklik veya hata olduğu görüldü. Özellikle dikkat çeken parametreler, MK çağrısının "Pazartesi" (%74,6) verilmesi, MK çağrısının çoğunun "dahiliye servislerinde" (%57,4) ve "hastaya müdahale edilmemesi" (%10,0) düşük de olsa verilmesiydi.

Sonuç: Bu çalışmada MKE'nde çalışan anestezi teknisyen/teknikerlerinin ileri yaşam desteği konusunda eğitim eksikliklerinin olduğu, ilk kurtarıcıların yaptığı müdahalelerde eksiklikler olduğu ve bazı müdahalelerin yapılmadığı belirlendi. Hastalara müdahale edecek herhangi bir işlemin başlatılmaması dikkat çekti. Dahili koğuşlardan sık sık MK talepleri ayrıntılı olarak araştırılmalıdır. Bu sayede birçok MK işlemi daha başarılı bir şekilde sonlandırılabilir veya MK ihtiyacının oluşması engellenebilir.

Anahtar Kelimeler: Anestezi teknisyeni/teknikeri, mavi kod, kardiyopulmoner arest, ilk müdahale ekibi

INTRODUCTION

The person calling the Blue Code (BC) is responsible for providing immediate basic life support to the patient until the Blue Code Team (BCT) arrives and intervenes.[1] Although healthcare professionals working in hospitals have received basic life support training, they may have had little or no opportunity to practice this training during a BC. As a result, first responders may be reluctant to use CPR and defibrillators in the event of cardiopulmonary arrest.[2] In particular, healthcare professionals working in clinics where Blue Code (BC) calls are infrequent and who are inexperienced in this area should have basic life support skills. In addition, they should have sufficient knowledge and be able to immediately provide the patient with a normal or automatic external defibrillator, pull the crash cart, prepare emergency medications (adrenaline, dopamine, atropine, lidocaine, etc.), and prepare emergency equipment (ECG palette, airway, mask, laryngoscope, intubation tube, IV catheters, injector, aspiration probe, etc.).

BC is usually performed by a team with expertise/experience in this field. The role of this team is to be on standby and to have a technical communication system in place. Preliminary preparations and interventions should be managed by the people giving the code until the team arrives at the patient's bedside. In the process, BCT should reach the patient in time and "the first rescuers giving BC should use the available equipment appropriately, and good situation management should be done after the interventions are effectively applied to the patient".[3] BCT usually consists of a physician in charge of the team (mainly a specialist in anesthesia, cardiology, pulmonology, internal medicine, neurology, family medicine, cardiovascular surgery or thoracic surgery) and health care personnel (anesthesia technician, nurse, health officer, etc.).

The aim of this study is to find out the observations of anesthesia technicians who are part of the BCT, on the interventions of the first rescuers on the patient when they arrive at the scene after the BC call has been made, to identify the shortcomings and to discuss what solutions, if any, can be found according to the characteristics of these shortcomings. The aim is to increase the survival rate of in-hospital cardiac arrests.

MATERIAL AND METHOD

Our study is a descriptive and cross-sectional study. The ethical evaluation of the study was conducted by the Ethics Committee of Yozgat Bozok University and approved with the number 01/18 on 25/01/2023. The population of our study consists of anesthesia technicians in Turkey. The first anesthesia technicians graduated from the health vocational schools opened in 1984-1985 and the total number of graduates until today is 59763 people. Considering this number (n=59763), a sample group of 382 people is predicted with a 95% confidence interval and a margin of error of 0.05. The survey method was preferred to reach all anesthesia technicians. The survey form was prepared on Google Form and participants were reached via social media platforms and email. 657 people completed the survey form. A total of 89 people who were not anesthesia technicians or who were not on

BC team were excluded from the survey. A total of 568 people were included in the study.

The questionnaire consisted of 44 questions in two parts. In the first part of the questionnaire there are nine questions about gender, age, marital status, educational status, occupation, years of employment, institution of employment, region of institution of employment, and district of institution of employment.

The second part consists of 35 questions about the observations of BC team rearding the interventions of first responders at the time they arrived the place where BC was given.

The data collected were analyzed using IBM SPSS version 20.0. Data were analyzed using percentage and frequency distributions and correlation analysis. Chi-square test was used for statistical analysis. The statistical significance level was set at p≤0.05.

RESULTS

Of the 657 participants, 568 were included in the study. The mean age was 27 ± 6.64 years. 72.9% of the participants were female, 40.7% were in the 20-24 age group, 63.0% were single, 68.0% had an associate degree, 59.7% had 0-4 years of work experience, 46.1% worked in a public hospital, 30.8% worked in the Marmara region, and 80.3% worked in the central district. The socio-demographic distribution of the participants is shown in **Table 1**.

Table 1. Socio-demographic Structure.		
Socio-demographic Structure.	n=568	%
1.Gender		
Male	154	27.1
Female	414	72.9
2. Age		
20 - 24 Years	231	40.7
25 - 29 Years	191	33.6
30 - 34 Years	65	11.4
35 Years and Over	81	14.3
3. Marital Status		
Single	358	63.0
Married	210	37.0
4. Education Status		
Health Vocational High School	21	3.6
Associate Degree	386	68.0
Lisans	148	26.1
License	12	2.1
PhD	1	0.2
5. Work Experience		
0 - 4 Years	339	59.7
5 - 9 Years	96	16.9
10 - 14 Years	56	9.9
15 Years and Over	77	13.6
6. Institution of Employment		
State Hospital	262	46.1
Private Hospital	138	24.3
Training and Research Hospital	122	21.5
University Hospital	32	5.6
Foundation University Hospital	3	0.6
Other	11	1.9
7. Region of institution of employment		
Marmara Region	175	30.8
Ege Region	59	10.4
Akdeniz Region	50	8.8
İç Anadolu Region	144	25.4
Karadeniz Region	62	10.8
Doğu Anadolu Region	35	6.2
Güney Doğu Anadolu Region	43	7.6
8. District of institution of employment		
Central district	456	80.3
Provincial District	112	19.7

The ratings of the participants' responses to the assessment of the first responders are shown in **Table 2**.

When looking at the participants' answers regarding the wards where BC was given, the most BC was given in the 'internal medicine' ward, while the clinic where the least BC was given was the 'physiotherapy' ward. The wards where BC was given are shown in **Table 3**.

The rating of the first responders according to the institution of employment is shown in **Table 4**.

The days on which the participants were given MK are shown in **Table 5**

Table 5. Table 5 shows the days given BC according to the answers of the participants. *		
Days	**N**	**%**
Monday	424	74.6
Tuesday	369	65.0
Wednesday	376	66.2
Thursday	380	66.9
Friday	402	70.8
Saturday	333	58.6
Sunday	316	55.6
* More than one option is selected.		

Table 2. The assessment of the first responders			
Questions (n=568)	**Yes (n)**	**No (n)**	**Sometimes (n)**
1. The first intervention has been initiated by the doctors or health care staff of the clinic.	220	70	278
2. The emergency trolley, which should be available in clinics, was taken to the patient.	343	60	165
3. Patients were monitored.	250	84	234
4. Drugs that are likely to be administered to the patient (adrenaline, atropine, sodium bicarbonate, etc.) were prepared by the clinic team.	219	144	205
5. The shock position was given to the patient.	128	214	226
6. The automated external defibrillator (AED) was brought to the scene.	211	215	142
7. The defibrillator has been brought to the patient.	292	98	178
8. The patient with respiratory failure was intervened with airway materials such as bag-valve mask or airway.	241	110	217
9. The CPR backboard required for CPR was placed under the patient.	120	302	146
10. Cardiopulmonary resuscitation (CPR) was started on the patient whose breathing and circulation had stopped.	308	52	208
11. The interventions made to the patient were recorded.	383	88	97
12. The patient was transferred to the nearest clinic or intensive care unit.	342	113	113
13. Security measures were taken by security personnel.	345	74	149
14. No intervention was made on the patient.	57	312	199

Table3. BC given wards		
Wards	**n**	**%**
Internal Medicine	326	57.4
Thoracic diseases	245	43.1
Polyclinic	237	41.7
Cardiovascular Surgery	162	28.5
Laboratory departments (blood sampling, ultrasound, etc.)	145	25.5
General Surgery	143	25.2
Thoracic surgery	121	21.3
Dialysis Unit	119	21.0
Neurology	106	18.7
Obstetrics/Gynaecology	97	17.1
Neurosurgery	89	15.7
Infectious Diseases	75	13.2
Burn Unit	48	8.5
Urology	47	8.3
Physiotherapy	32	5.7
Other services	200	35.2

DISCUSSION

The first person to see a patient whose general condition is deteriorating can be defined as the first rescuer. The first rescuer should assess the patient as quickly as possible and, in the case of respiratory and circulatory failure, inform the BCT quickly. The BCT should arrive at the scene within three minutes. While waiting for the BCT to arrive, the first rescuers (especially hospital staff) must intervene in the patient's care without wasting time. Baskett et al. reported that rapid initiation of basic life support and early defibrillation of the arrested patient until the arrival of BCT increased survival. [4] The aim of our study was to compile the observations of anesthesia technicians present in the BCT, to evaluate the practices of the first rescuers in their interventions and to help find solutions in the light of the information obtained here, thus increasing the survival rate.

Approximately 80% of the respondents to the questionnaire reported that incorrect BCT can be given. Eroğlu et al. reported an incorrect BC rate of 91%,[5] Baytar et al. 42.9%,[6] Kaykısız et al. 45%,[7] Canural et al. 61%,[8] and Arıkan et al. 13.3%.[9] The reason for the different results in the studies may be that most of the wrong code calls are not recorded in hospitals and the high number of patients in the hospital. In the literature, the reason for the low rate of BC practice has been attributed to the effectiveness of training given in hospitals. We thought that the reason for the high rate in our study might be the inadequacy of the training given to first responders, especially during the Covid-19 period.

The actions of first responders who intervene in patients with respiratory and circulatory arrest are critical. The earlier and more complete the intervention, the higher the survival rate of the patient. In our study, when the actions of the first responders were examined, it was found that only 60.4% pulled the emergency cart to the patient, 44% monitored the patient, 38.6% prepared emergency medications, 22.5% placed the patient in a shock position, 37.1% brought the AED to the scene, 21.1% placed the under-patient CPR board under the patient, 54.2% started CPR and, unfortunately, 10% did not intervene on the patient. A study by Incesu E. reported that 22.4% of patients did not receive any intervention before

the code team arrived at the scene.[10] When these figures were examined, it was concluded that the first responders did not intervene sufficiently, that there were deficiencies in preparation, and that these rates should be increased.

When the places where BC was given were examined, internal medicine services were the first with 57.4%, throacic diseases were the second with 43.1% and polyclinics were the third

with 41.7%. In the study conducted by Baytar, Arıkan and Kayır et al, internal medicine and neurology services were reported as the services where blue code was given the most. [6,9,11] The studies in the literature were compatible with our study. Since the general condition of the patients admitted to the internal medicine and thoracic clinic was poor, the BC rates may have been high.

Table 4. Evaluation of first responders by institution of employment.									
		Institution of employment							
		State Hospital		Training and Research Hospital		Private Hospital		University Hospital		P
		N	%	n	%	N	%	n	%	
1. The first intervention has been initiated by the doctors or health care staff of the clinic.	Sometimes	149	55.8%	70	54.7%	46	33.3%	13	37.1%	
	Yes	75	28.1%	46	35.9%	79	57.2%	20	57.1%	.000
	No	43	16.1%	12	9.4%	13	9.4%	2	5.7%	
2. The emergency trolley, which should be available in clinics, was taken to the patient.	Sometimes	86	32.2%	47	36.7%	23	16.7%	9	25.7%	
	Yes	145	54.3%	72	56.3%	105	76.1%	21	60.0%	.000
	No	36	13.5%	9	7.0%	10	7.2%	5	14.3%	
3. Patients were monitored.	Sometimes	119	44.6%	68	53.1%	35	25.4%	12	34.3%	
	Yes	96	36.0%	48	37.5%	92	66.7%	14	40.0%	.000
	No	52	19.5%	12	9.4%	11	8.0%	9	25.7%	
4. Drugs that are likely to be administered to the patient (adrenaline, atropine, sodium bicarbonate, etc.) were prepared by the clinic team.	Sometimes	101	37.8%	61	47.7%	27	19.6%	16	45.7%	
	Yes	88	33.0%	35	27.3%	86	62.3%	10	28.6%	.000
	No	78	29.2%	32	25.0%	25	18.1%	9	25.7%	
5. The shock position was given to the patient.	Sometimes	105	39.3%	59	46.1%	50	36.2%	12	34.3%	
	Yes	54	20.2%	10	7.8%	54	39.1%	10	28.6%	.000
	No	108	40.4%	59	46.1%	34	24.6%	13	37.1%	
6. The automated external defibrillator (AED) was brought to the scene.	Sometimes	64	24.0%	43	33.6%	27	19.6%	8	22.9%	
	Yes	86	32.2%	32	25.0%	79	57.2%	14	40.0%	.000
	No	117	43.8%	53	41.4%	32	23.2%	13	37.1%	
7. The defibrillator has been brought to the patient.	Sometimes	79	29.6%	66	51.6%	24	17.4%	9	25.7%	
	Yes	127	47.6%	47	36.7%	104	75.4%	14	40.0%	.000
	No	61	22.8%	15	11.7%	10	7.2%	12	34.3%	
8. The patient with respiratory failure was intervened with airway materials such as bag-valve mask or airway.	Sometimes	115	43.1%	62	48.4%	24	17.4%	16	45.7%	
	Yes	86	32.2%	44	34.4%	97	70.3%	14	40.0%	.000
	No	66	24.7%	22	17.2%	17	12.3%	5	14.3%	
9. The CPR backboard required for CPR was placed under the patient.	Sometimes	56	21.0%	36	28.1%	42	30.4%	12	34.3%	
	Yes	51	19.1%	13	10.2%	50	36.2%	6	17.1%	.000
	No	160	59.9%	79	61.7%	46	33.3%	17	48.6%	
10. Cardiopulmonary resuscitation (CPR) was started on the patient whose breathing and circulation had stopped.	Sometimes	108	40.4%	59	46.1%	27	19.6%	14	40.0%	
	Yes	126	47.2%	59	46.1%	104	75.4%	19	54.3%	.000
	No	33	12.4%	10	7.8%	7	5.1%	2	5.7%	
11. The interventions made to the patient were recorded	Sometimes	58	21.7%	20	15.6%	13	9.4%	6	17.1%	
	Yes	171	64.0%	81	63.3%	110	79.7%	21	60.0%	.005
	No	38	14.2%	27	21.1%	15	10.9%	8	22.9%	
12. The patient was transferred to the nearest clinic or intensive care unit.	Sometimes	54	20.2%	31	24.2%	21	15.2%	7	20.0%	
	Yes	150	56.2%	69	53.9%	104	75.4%	19	54.3%	.003
	No	63	23.6%	28	21.9%	13	9.4%	9	25.7%	
13. Security measures were taken by security personnel.	Sometimes	84	31.5%	40	31.3%	18	13.0%	7	20.0%	
	Yes	147	55.1%	66	51.6%	110	79.7%	22	62.9%	.000
	No	36	13.5%	22	17.2%	10	7.2%	6	17.1%	
14. No intervention was made on the patient.	Sometimes	108	40.4%	57	44.5%	24	17.4%	10	28.6%	
	Yes	29	10.9%	12	9.4%	14	10.1%	2	5.7%	.000
	No	130	48.7%	59	46.1%	100	72.5%	23	65.7%	
*Chi-Square Test										

The interventions of the first rescuers when BC was given were compared in terms of hospitals. All questions except 'No intervention was made on the patient' were answered positively by private hospital staff in a statistically significant way. Although this may indicate a more sensitive approach to the situation in private hospitals, the possibility of bias cannot be ruled out. Looking at the situation from a different perspective, deficiencies of between 30% and 80% were found in practices other than private hospitals. This situation indicates a lack of training, experience or skills in general, which should be taken into account and efforts should be made to remedy it.

When the days on which BC was given were examined, it was found that code blue calls were mostly given on weekdays and most frequently on Monday. In the study by Çiçek F. et al, 73.4% were reported to be given on weekdays.[12]

CONCLUSION

The fact that the first rescuer is trained, experienced and has intervention skills is of great importance during the 3-minute critical period when the BCT is expected to reach the patient after the warning is given. The anesthesia technicians who took part in the survey reported what they saw when they reached the patient within this three-minute period. The available data showed that there was up to 70% agreement in practice for very few of the procedures performed. For some of the procedures that should have been performed, it was found that there was a low level of practice of 20% and, unfortunately, 10% of patients were not treated at all. These results cannot be considered acceptable. People who have the potential to be first responders should definitely be highlighted and trained.

As BC practices are frequent on Mondays and in some clinics, it should be ensured that those working in these departments improve their skills in particular and that the follow-up of patients on weekends and during the week is of similar quality.

ETHICAL DECLARATIONS

Ethics Committee Approval: The ethical evaluation of the study was conducted by the Ethics Committee of Yozgat Bozok University and approved with the number 01/18 on 25/01/2023.

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

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

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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