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Determination of Information Status of Pre-Hospital Emergency Medical Services Personnel on Peri-arrest and Arrest Rhythms

Şimşek Çelik[1]*, Ertuğ Günsoy[2], Behnan Gülünay[1], Pelin Çelik[3]

[1]Sivas State Hospital, Sivas, Turkey
[2]Ministry of Health University Van Training and Research Hospital, Van, Turkey
[3]Vocational School of Health Services, Sivas Cumhuriyet University, Sivas, Turkey

ABSTRACT:
Purpose: This research was carried out to determine the knowledge of pre-hospital emergency health care personnel about peri-arrest and arrest rhythms.
Material and Methods: The present research is designed as a descriptive study. The sample of the research was formed by 80 health personnel working in the Sivas 112 Emergency Health Services unit. In collecting research data "Individual Information Form" and "Pre-Hospital Emergency Health Services Personnel's Information on Peri-arrest and Arrest Rhythms Evaluation Form" were used. Number, percentage, mean and independent samples t-test were used in the statistical evaluation of the data.
Results: It was determined that 63.75% of the emergency health services personnel participating in the study were male, their average age was 24.00±5.12, their tenure in emergency health services was 2.90±4.37 and 51.25% did not receive in-service training. It was found that pre-hospital emergency health care personnel who received in-service training had significantly higher scores with correct answers and treatment choices on peri-arrest and arrest rhythms and their related treatments compared to the group who did not receive in-service training (p = 0.03).
Conclusion: Regular in-service training for pre-hospital emergency health care personnel is of great importance in increasing the knowledge about fatal rhythms and related treatments.
Keywords: *Pre-hospital emergency medical services; Arrest rhythms; Peri-arrest rhythms*

Hastane Öncesi Acil Sağlık Hizmetleri Personelinin Peri-arrest ve Arrest Ritimler Hakkındaki Bilgi Durumlarının Belirlenmesi

ÖZET:
Amaç: Bu araştırma, hastane öncesi acil sağlık hizmetleri personelinin peri-arrest ve arrest ritimler hakkındaki bilgi durumlarının belirlenmesi amacıyla yapılmıştır.
Gereç ve Yöntem: Araştırma tanımlayıcı özelliktedir. Araştırmanın örneklemini, Sivas 112 Acil Sağlık Hizmetleri biriminde görev yapan 80 sağlık personeli oluşturdu. Araştırma verilerinin toplanmasında, "Birey Tanıtım Formu" ve "Hastane Öncesi Acil Sağlık Hizmetleri Personelinin Peri-arrest ve Arrest Ritimler Hakkındaki Bilgilerini Değerlendirme Formu" kullanıldı. Verilerin istatistiksel değerlendirmesinde sayı, yüzde, ortalama ve bağımsız örneklem t-testi testi kullanıldı.
Bulgular: Çalışmaya katılan acil sağlık hizmetleri personelinin %63.75'inin erkek, yaş ortalamalarının 24.00±5.12, acil sağlık hizmetlerindeki görev süresinin 2.90±4.37 olduğu ve %51.25'inin hizmet içi eğitim almadığı belirlendi. Peri-arrest ve arrest ritimler ve ilgili tedavileri konusunda, hizmet içi eğitim almış hastane öncesi acil sağlık hizmetleri personelinin, hizmet içi eğitim almamış gruba göre, doğru yanıtlarla ve tedavi seçimleriyle anlamlı derecede daha yüksek puanlara sahip oldukları tespit edildi (p = 0,03).
Sonuç: Hastane öncesi acil sağlık hizmetleri personeline düzenli olarak hizmet içi eğitim verilmesi, ölümcül ritimler ve ilgili tedavileri konusundaki bilgilerin artırılmasında büyük önem arz etmektedir.
Anahtar Kelimeler: *Hastane öncesi acil sağlık hizmetleri; Arrest ritimler; Peri-arrest ritimler*

*Corresponding author: Şimşek Çelik, email: drsimsek19@gmail.com

INTRODUCTION

Cardiac disorders including peri-arrest rhythms and dysrhythmias are among the most frequently reported cause of sudden death in Turkey and in the World and according to data of World Health Organization (WHO), 17,3 million people died from cardiovascular disorders (CVD) in the year 2008 alone, which is predicted to show a steep increase and rise to 23 million in the year 2030 (Zeytin et al., 2014; Ghuran et al., 2008). Cardiac disorders include a cluster of disorders within itself among these acute coronary disorders and its related complications dysrhythmias constitute a considerable place. However, dysrhythmias, such as supraventricular tachycardia (SVT), might also be observed without the presence of acute coronary disorders (Brugada et al., 2019). Malignant dysrhythmias such as ventricular fibrillation (VF), bradycardia and ventricular tachycardia (VT) constitute a life-threatening situation even in countries with advanced medical care (Link et al., 2015). Rhythms such as ventricular fibrillation/pulseless ventricular tachycardia (VF/pulseless VT) constitute 6% of all cardiac deaths (Osei-ampofo, 2016). For example, diagnosis of ventricular fibrillation and early defibrillation reduce mortality by more than 50% (Soar, 2015). Malign dysrhythmias, as ventricular fibrillation (VF), bradycardia and ventricular tachycardia (VT), constitute a life-threatening condition even in countries with a well-developed medical care (Link et al., 2015). Thus, their prehospital management by emergency medical service (EMS) providers is particularly important for patient survival and consequent life quality (De Lorenzo et al., 1993). Incorrect recognition of these rhythms, and consequent inappropriate treatment applications may result in mortality and morbidity, which means correct recognition is of due importance for patient survival and consequent life quality. In a study conducted by Ohlow et al., it was found that pre-hospital diagnosis rates of stable WCT (large complex tachycardia) cases were low (Ohlow et al., 2005).

There are two main guidelines, which are European Society of Cardiology (ESC) and American Heart Association (AHA), organizing the accurate initial identification and treatment algorithm of all groups of dysthymias, including VT, VF, SVT and bradycardia (Page et al., 2016). In Turkey, the EMS providers, responsible for the first rhythm identification and management of dysthymias in the field, include paramedics, emergency medical technicians (EMT) and nurses. Under current conditions, it has been observed that EMS providers cannot generally attain adequate levels for initial identification and management of life-threatening dysthymias because of two main problems, the first of which is misidentification of the rhythm displayed on the monitor and the latter of which is the application of wrong treatment algorithm (De Lorenzo et al., 1993; Hale et al., 2011).

In the present study, our primary purpose was to evaluate the levels of accuracy of EMS providers in identification and management of dysthymias by their responses to different patient scenarios.

MATERIAL and METHODS

Purpose and Type of the Study

This research is a descriptive study to determine the knowledge of pre-hospital emergency health care personnel about peri-arrest and arrest rhythms.

Sampling and participant

This research was conducted with emergency medical technicians, paramedics and nurses working in Sivas 112 Emergency Health Services unit in 2019. The universe of the research was composed of the emergency medical technician, paramedics and nurses working in Sivas 112 Emergency Health Services Unit. The sample of the study consisted of 11 emergency medical technicians, 47 paramedics and 22 nurses who agreed to participate in the study.

Data Collection Tools

In collecting research data, “Individual Information Form” and “Pre-Hospital Emergency Health Services Personnel's Information Form on Peri-arrest and Arrest Rhythms” were used.

Individual Information Form: In this form, there are 4 questions prepared by the researchers in line with the literature, including the descriptive characteristics of the pre-hospital emergency health care personnel such as gender, age, tenure in the

unit and in-service training.

Evaluation Form of Pre-Hospital Emergency Medical Services Personnel's Information on Peri-arrest and Arrest Rhythms: In this form prepared by the researchers in line with the literature information, the patient's anamnesis, vital signs, stable or unstable general condition and the patient in which different fatal rhythms are defined in each question. It consists of 10 multiple-choice questions for participants to recognize fatal rhythms using scenarios and to determine the appropriate treatment option.

Statistical Analysis

The analysis of the data obtained from the study was performed in the Statistical Package for Social Science (SPSS) 22.0 package program. In evaluating the data; number, percentage, mean and independent samples t-test was used.

Ethical Approval

Written permission was obtained from Sivas Cumhuriyet University Non-Interventional Clinical Research Ethics Committee (Decision number: 2019-09/10) for the application of the study. Verbal consent was obtained from the participants in the study. All participants were included in the study voluntarily. In addition, their consent was obtained in written informed consent forms, after explaining the purpose of the study, for what purpose the results would be used, and that information about them would not be disclosed to others.

RESULTS

It was determined that 63.75% of the emergency health services personnel participating in the study were male, their average age was 24.00±5.12, their tenure in emergency health services was 2.90±4.37 and 51.25% did not receive in-service training (Table 1).

Table 1. Demographic characteristics of the participants

	n	%
Gender		
Male	51	63.75
Female	29	36.25
In-service Training		
Yes	39	48.75
No	41	51.25
Age (Mean ± SD)	24.00±5.12	
Lenghts of Work Experience (Mean ± SD)	2.90±4.37	

Among the questions, the one responded with the highest accuracy rate (73.8%) was the initial part of the first question aiming at determining the correct ECG rhythm, which was sinus tachycardia (see Table 2). In terms of determining the correct treatment among options, the questions with highest accuracy rate were the second part of the question 7, targeting at accurate option of stable bradycardia algorithm and the second part of the question 2, targeting at accurate option of stable SVT algorithm, with accuracy rates of 77.5% and 75%, respectively (Table 2). The questions with the lowest accuracy rates were the initial parts of the question 4 and 5, aiming at determining the correct ECG rhythms, with accuracy rates 37.6% and 30%, respectively (see Table 2). In terms of choosing the correct treatment among the options, the questions with the lowest accuracy rates were second parts of the questions 6 aiming at opting for unstable VT algorithm and 1 aiming at opting for treating the possible underlying cause or observation of vitals instead of intervening to the present rhythms, 30% and 21.2%, respectively (Table 2).

When the accuracy scores of the two participant groups were compared overall, the mean scores of the in-service training group were found to be significantly higher in comparison with the non-in-service training group (p=0.03) (Table 3). Moreover,

when the accuracy rates of the two groups were compared for individual questions separately, VF and pulseless electrical activity (PEA), which are among arrest rhythms, the group with previous in-service training interpreted VF and PEA rhythms and selected the correct treatment according to the rhythms with a higher accuracy rate in comparison with the without in-service training group (Table 4).

Table 2. The accuracy and inaccuracy rates of each question with each part

Questions	Knowing the Correct treatment		Knowing the False treatment		Total	
	n	%	n	%	n	%
1-Sinus tachycardia rhythm identification						
Correct	14	17.5	45	56.3	59	73.8
False	3	3.7	18	22.5	21	26.2
2-SVT rhythm identification unstable patient						
Correct	34	42.5	11	13.8	45	56.3
False	26	32.5	9	11.2	35	43.7
3-AF rhythm identification in stable patient						
Correct	32	40	8	10	40	50
False	24	30	16	20	40	50
4-AF rhythm identification in unstable patient						
Correct	17	21.3	13	16.3	30	37.6
False	15	18.7	35	43.7	50	62.4
5-Sinus rhythm and RBBB identification in stable patient						
Correct	16	20	8	10	24	30
False	23	28.7	33	41.3	56	70
6-VT rhythm identification in unstable patient						
Correct	18	22.5	27	33.8	45	56.3
False	6	7.5	29	36.2	35	43.7
7-Idioventricular rhythm identification in stable patient						
Correct	44	55	3	3.8	47	58.8
False	18	22.5	15	18.7	33	41.2
8-Third-degree atrioventricular block rhythm identification in unstable patient						
Correct	34	42.5	7	8.8	41	51.3
False	19	23.7	20	25	39	48.7
9-PEA rhythm identification						
Correct	36	45	8	10	44	55
False	10	12.5	26	32.5	36	45
10-VF rhythm identification						
Correct	43	53.7	5	6.3	48	60
False	10	12.5	22	27.5	32	40

VF: Ventricular fibrillation, **PEA:** Pulseless electrical activity, **VT:** Ventricular tachycardia, **SVT:** Supraventricular tachycardia, **AF:** Atrial fibrillation, **RBBB:** Right bundle branch block.

Table 3. Number of accurate responses to the question in total.

	In-service Training	Without in-service training	p
Correct Answer (Mean ± SD)	9.7±4.8	11.9±3.6	0.03

Table 4. Comparison of the in-service and without in-service training groups in terms of the number of accurate and inaccurate responses to the questions related to VF and PEA rhythms

	In-service Training		Without in-service training		
	n	%	n	%	p
Identification of VF rhythm					
Correct	29	36.3	19	23.8	0.01
False	10	12.5	22	27.5	
Knowing of VF treatment					
Correct	31	38.8	22	27.5	0.01
False	8	10	19	23.8	
Identification of PEA rhythm					
Correct	21	26.3	23	28.7	0.84
False	18	22.5	18	22.5	
Knowing of PEA treatment					
Correct	26	32.5	20	25	0.1
False	13	16.3	21	26.3	

DISCUSSION

Electrocardiography interpretation and rhythm detection by EMS providers are a vital part of prehospital care for patients with malignant dysrhythmia (Slovis et al., 2003). In most cases, EMS providers, including paramedics, EMT and nurses, begin the treatment of life-threatening conditions in FMC on the scene. To ensure correct treatment, EMS providers must make an accurate diagnosis, so they must be aware of rhythm identification and guidelines for arrhythmia for this purpose. In our study, it was determined that the rate of in-service training of the participants was low. It is possible for employees to have up-to-date information on the instructions through continuous in-service training. In-service training is necessary for every healthcare worker to increase their knowledge and skills, to follow technological developments closely, to ensure their professional development, and to take part in scientific and technological developments (Eryılmaz et al., 2004; Atay et al., 2009).

Because some dysrhythmias can be life-threatening, immediate rhythm identification and treatment is required based on the knowledge of EMS providers. For dysrhythmias, especially for cardiac arrest rhythms (VF, pulseless VT, PEA, asystole), misidentification followed by inappropriate treatment is often associated with poor survival (Brown et al., 1997). It is among the most important lethal rhythms in VF and pulseless VT, these rhythms are provided with spontaneous recirculation of the heart only with early defibrillation. Without defibrillation, survival is reduced by 7-10% (Niemann et al., 2001). Early defibrillation is important for prehospital survival in rough VF. Survival was higher as a result of early defibrillation in witnessed VF compared to unverified VFs (Hargarten et al., 1990). In our study, it was determined that the rate of accurate knowledge of unstable VT treatment is lower. International guidelines such as AHA and ESC (2020) recommend that wide QRS tachycardia therapy be administered when there is an uncertainty as to whether the case is VT or SVT in the case of block leading to wide QRS.

In VF, on the other hand, rhythm recognition and knowing the treatment were significantly higher in those who received in-service training compared to those who did not. In a study conducted on paramedics in 2017, it was found that the narrow QRS tachycardia ECG has a higher accuracy rate compared to the wide QRS ECG, in consistent with the results of this study (Honarbakhsh et al., 2017). In our study, consistent with the literature, narrow QRS tachycardia (sinus tachycardia) was found to have the highest accuracy rate in terms of accurate identification of the given rhythms. In our study, while the participants had the highest accuracy in rhythm recognition of sinus tachycardia compared to other rhythms, they failed to select the correct treatment algorithm. Common causes of sinus tachycardia are not due to cardiac dysrhythmias. Instead, the underlying causes may be high fever,

infection, hypovolemia, hypertoroid, etc. Any effective intervention for sinus tachycardia should aim to treat these underlying causes. Participants incorrectly selected options targeting cardiac dysrhythmia management, such as the tachycardia (SVT) algorithm, without taking these common causes into account.

If untreated, AF is the most common arrhythmia that increases mortality and morbidity in in-hospital and pre-hospital emergency medicine. Tachyarrhythmia caused by AF sometimes causes serious circulatory disorders (Nino et al., 2020). For these reasons, although AF is a very important rhythm disorder for patients, the rate of AF rhythm recognition was found to be very low among the participants in our study.

Pre-hospital diagnosis rates of stable WCT (large complex tachycardia) cases are low (Ohlow et al., 2005). Similarly, the rate of recognizing wide-complex tachycardia was found to be low in our study.

Smith et al. (2014), in their study, pre-hospital emergency health care workers knew the SVT correctly at a rate of 96% on the ECG, 24% of the patients were performed the Valsalva maneuver, 31% spontaneously, and 4% verapamil, in total% of patients. It was determined that the heart rhythm of 59 patients returned to normal sinus rhythm upon arrival (Smith et al., 2014). As seen in the study, if SVT patients are diagnosed correctly and appropriate treatment approaches are made, the majority of them return to normal sinus rhythm before they reach the hospital. In our study, in accordance with the literature, it was determined that the rate of recognition of the SVT rhythm and the correct knowledge of the appropriate treatment approach were higher compared to other rhythms.

CONCLUSION

Although the EMS providers are frequently encountered with the dysrhythmias as the providers in initial contact with these patients, they still confuse the rhythms and algorithms, which may result in mortality and morbidity. Nevertheless, the participants with in-service training, though not satisfactory, had better identification and selection results than without in-service training group. However, to the knowledge of the researchers, in the related literature, the number of studies focusing on the prehospital identification of STEMI is much higher than those of narrow and wide QRS rhythms. the finding that the low accuracy levels considering the correct identification of VF and PEA, which are arrest rhythms, is a concern for prehospital care quality. However, considering VF and PEA, the participants with in-service training, though not satisfactory, had better identification and selection results than non-in-service training group. As a result, it can be argued that the number and quality of in-service training targeting EMS providers might lead to a prehospital care with a much a higher quality, thus decreasing any related mortality and morbidity.

Conflict of Interest

The authors declare that they have no conflict of interest.

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