Evaluation of Basic and Advanced Life Support Knowledge of Health Workers

Ramazan KIYAK [1], Bahadir CAGLAR [1], Suha SERIN [1], Meliha FINDIK [1],
Muhammed CAKAS [1], Ahmet BUGRA ONLER [1]

[1] Balikesir University, Faculty of Medicine Emergency Medicine Department

ABSTRACT

Objective: Our aim was to assess the knowledge and skill levels of health workers in our hospital in relation to basic and advanced life support and to see if there was a difference before and after the training. **Materials and Methods:** The training was administered in the light of the updates in the Universal Basic and Advanced Life Support guidelines, and according to the AHA guidelines, with one day of theory and one day of practice. After the training, evaluation was done with the post-test. The demographic information of the participants, the distribution of tasks and the changes between the pre-test and the post-test according to their professional status were statistically evaluated. **Results:** We look at the training in both basic life support and advanced life support the level of knowledge of the participants increased. **Conclusion:** When we evaluate the changes in the knowledge levels of the participants after the course, we can say that the level of knowledge and awareness was limited before the training. We think that trainings should be repeated at certain intervals.
Keywords: Basic Life Support, Advanced Life Support, Education, Health Personnel.

Sağlık Çalışanlarının Temel ve İleri Yaşam Desteği Bilgilerinin Değerlendirilmesi

ÖZ

Amaç: Hastanemizdeki sağlık çalışmalarının temel ve ileri yaşam desteği ile ilgili bilgi ve beceri düzeylerini değerlendirmek ve eğitim öncesi ve sonrasında bir fark olup olmadığını görmektir. **Gereç ve Yöntem:** Eğitim, Evrensel Temel ve ileri Yaşam Desteği kılavuzundaki güncellemeler ışığında ve AHA kılavuzuna göre bir gün teorik ve bir gün pratik uygulama olarak anlatılmıştır. Eğitim sonrasında son test ile değerlendirme yapılmıştır. Katılımcıların demografik bilgileri, görev dağılımları ve mesleki durumlarına göre ön test ve son test arasındaki değişimler istatistiksel olarak değerlendirildi. **Bulgular:** "Hem temel yaşam desteği hem de ileri yaşam desteği eğitimlerine baktığımızda katılımcıların bilgi düzeyinin arttığı görülmektedir. **Sonuç:** Kurs sonrası katılımcıların bilgi düzeylerindeki değişimleri değerlendirdiğimizde bilgi ve farkındalık düzeyinin eğitimden önce sınırlı olduğunu söyleyebiliriz. Eğitimlerin belirli aralıklarla tekrarlanması gerektiğini düşünüyoruz.
Anahtar Kelimeler: Temel Yaşam Desteği, İleri Yaşam Desteği, Eğitim, Sağlık Personeli.

Sorumlu Yazar / Corresponding Author: Ramazan KIYAK, Balikesir University, Faculty of Medicine, Department of Emergency Medicine Department, Balikesir, Türkiye.
E-mail: kiyak1903@hotmail.com

INTRODUCTION

Cardiopulmonary arrest is the sudden cessation of respiration and circulation due to different reasons. (Balci, 2011) If cardiopulmonary resuscitation (CPR) is not applied immediately to a patient with cardiopulmonary arrest, the brain will start to get damaged within minutes after respiratory and circulatory arrest. For this reason, CPR should be started immediately after the heartbeat stops. (NÖ., 1998.) Basic Life Support (BLS) and Advanced Life Support (ALS), which are the stages of CPR, are vital practices (American Heart Association, 2010).

It is known that immediate initiation of CPR to every patient who is evaluated as suffering from a cardiac arrest increases the probability of survival of the patient, and that every minute delayed for each of the steps of CPR and ALS decreases the chance of survival by 5.5% (Larsen, 1993). It is known that in approximately 84% of in-hospital cardiopulmonary arrests, clinical findings progressively worsen in the last eight hours and in-hospital morbidity and mortality increase, mostly due to deficiencies in rapid diagnostic and therapeutic approaches (Hodgetts, 2002). Therefore, it is reported that the primary and most important approach for the prevention of cardiopulmonary arrests in the hospital depends on the in-hospital action plan for early recognition, treatment and early transfer of high-risk patients to intensive care. The level of knowledge and skill in CPR of the healthcare worker who first encounter a patient who acutely deteriorates or has cardiopulmonary arrest in the hospital is the most important criteria for providing rapid and correct intervention (Swor, 2006).

Studies have shown that rapidly initiated and effectively applied CPR increases the likelihood of survival, while delay decreases the patient's chance of survival (Baskett, 2008). However, many studies show that knowledge and application skills of CPR are not widespread enough among healthcare worker, and that training programs are needed (Demirkıran et al., 2003).

In healthcare organizations, especially the personnel responsible for the care and treatment of patients should receive CPR training and update their knowledge by repeating it at regular intervals. Therefore, it is recommended that CPR training should be received by both health care workers and health care support personnel (Baskett, 2005).

In our hospital, the first intervention in cardiopulmonary arrest is usually performed by the nurse, paramedic, emergency medical technician or physician following a patient. In addition, unlike other healthcare organizations, the hospital resuscitation (Code Blue) team consists of Emergency Medicine assistants. After taking over a patient, the team continues basic and advanced life support practices. Our plan of organizing training is to provide the personnel who will make the first intervention to a patient with cardiopulmonary arrest until the resuscitation team arrives with the ability to make the correct diagnosis, to apply basic life support steps quickly and correctly, and to perform safe defibrillation.

This study aims to evaluate the level of knowledge of all healthcare personnel working in university hospitals, to examine the effectiveness of training programs, and to make recommendations for the improvement of training programs in the light of the findings obtained.

MATERIALS AND METHODS

After obtaining approval from Balikesir University (25/6/2024, decision no: 2024/93), BLS-ALS training was conducted at Balikesir University Seminar Hall, on 16.07.2024-17.07.2024 under the coordination and responsibility of the hospital education commission. BLS and ALS knowledge of health and non-health worker (secretary, security, etc.) working in Balikesir University was evaluated by pre-test and post-test.

The knowledge assessment questionnaire was prepared by the researchers using the current data of the American College of Cardiology (AHA) and the European Resuscitation Council (ERC) to assess the level of cardiopulmonary resuscitation knowledge to be used in pretest and posttest. 2023 AHA (American Heart Association) guidelines were used in theoretical lectures and practices. Assessment test questions were created separately for CPR and ALS. The evaluation test was made out of 10 questions before and after the training. The questions were multiple-choice, and the evaluation was calculated by giving 1 point for each correct answer and 0 point for each incorrect answer. The lowest score was 0 and the highest score was 10. The courses were taught by emergency medicine residents and faculty members. The same instructors gave assessment exams at the beginning and at the end of the training.

Training dates were planned so as not to affect the participants' working time. A total of 113 people including physicians, nurses, emergency medical technicians, medical secretaries, security, personnel, pharmacists, audiometrists, elderly-care workers, midwives, IT technicians and other technicians participated in the trainings. The BLS training was attended by 45 people and the ALS training by 88 people.

Adult and pediatric half-body training manikins (Simulaids) were used for the applications.

Statistical analysis

Quantitative analysis methods were used in the evaluation of the data. SPSS26.0 (Statistical Package for the Social Science) software program was used during the analysis. Descriptive statistics, difference analysis (t test and ANOVA) and Wilcoxon Test were performed in this program. Frequency, percentage, mean and median values were calculated. Wilcoxon Test was used to evaluate the difference between pre-

test and post-test results. p<0.05 was considered statistically significant.

RESULTS
45 people participated in the BLS training held on 16.7.2024-17.7.2024 in the meeting hall. In the ALS training, there were 88 people in total with the participation of the members of the same professions. The majority of the participants were between 26-45 years of age. Female participants had a higher proportion than male participants in both types of training. In terms of working period, it was determined that the majority of the participants had a working period of 5-10 years (28.9%).

The participants were nurses (28.9%) and medical secretaries (17.8%) and staff (17.8%), respectively (Table 1).

Table 1. Sociodemographic characteristics of the participants.

Variables		Basic life support		Advanced life support	
		n	%	n	%
Age	18-25 years old	4	8.9	23	26.1
	26-35 years old	16	35.6	35	39.8
	36-45 years old	18	40	27	30.7
	46-60 years old	7	15.6	3	3.4
Sex	Male	14	31.1	17	19.3
	Woman	31	68.9	71	80.7
Working period	1-3 years	9	20	25	28.41
	3-5 years	2	4.4	11	12.50
	5-10 years	13	28.9	18	20.45
	10-15 years	8	17.8	14	15.91
	15 years and above	13	28.9	13	14.77
Receiving basic / advanced life support training	Yes	19	42.2	67	76.1
	No	26	57.8	21	23.9
Profession	Nurse	13	28.9	63	71.6
	EMT	2	4.4	3	3.4
	Medical Secretary	8	17.8	-	-
	Security	3	6.7	-	-
	Staff	8	17.8	-	-
	Pharmacist	1	2.2	-	-
	Audiometrist	2	4.4	-	-
	Elderly Care	1	2.2	-	-
	Midwife	1	2.2	-	-
	Data Processing Technician	2	4.4	-	-
	Doctor	2	4.4	-	-
	Technician	2	4.4	22	90.9
Total		45	100	88	100

When it was examined whether the participants had received basic life support training before, it was seen that 57.8% had not received any training before (Table 1). Looking at the answers they gave to the questions of the BLS test, it was seen that the most correct answers were given to the question " What is Basic Life Support?" both in the pre-test (82.22%) and post-test (97.78%). The question with the least number of correct answers in the pre-test was "How many cm should the sternum be lowered in heart massage for adults?" (24.44%). In the post-test, this rate increased to 86.67%. In the post-test, the least correct answer was the question "In which of the following is the correct order of application of basic life support for an adult patient / injured person?" (80%). While the correct response rate was 46.67% in the pre-test for the question "How many times per minute should CPR be performed in adults?", this rate increased to 93.33% in the post-test (Table 2). Although 76.1% of the participants stated that they had received ALS training before, it shows that there was a significant improvement in their knowledge level with the training (Table 1-3). In the question "What should be the dose and form of adrenaline administration in anaphylaxis in adult patients?", while the correct response rate was 19.32% in the pre-test, this rate increased to 77.27% in the post-test. This shows how effective the training program was in helping the participants learn the critical information. In the question "When is Amiodarone used in adult advanced life support?", the correct response rate increased from 44.32% in the pre-test to 95.45% in the post-test, and the level of knowledge appears to have increased significantly.

Table 2. Distribution of participants' responses to basic life support test questions.

Distribution of responses to basic life support test questions	Pre-Test				Post-Test			
	That's right		Wrong		That's right		Wrong	
Questions (n=45)	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
What is Basic Life Support?	37	82.22	8	17.78	44	97.78	1	2.22
How many times per minute should CPR be performed in adults?	21	46.67	24	53.33	42	93.33	3	6.67
Which of the following is the area to perform CPR on adult victims?	16	35.56	29	64.44	37	82.22	8	17.78
Which of the following is the first step in assessing the victim?	27	60.00	18	40.00	43	95.56	2	4.44
How to make the most accurate respiratory assessment in basic life support?	36	80.00	9	20.00	44	97.78	1	2.22
How many cm should the sternum be lowered during CPR in adults?	11	24.44	34	75.56	39	86.67	6	13.33
How many breaths and heart massage does 1 round of basic life support consist of?	33	73.33	12	26.67	44	97.78	1	2.22
In which of the following is the basic life support application sequence for an adult patient / casualty given correctly?	17	37.78	28	62.22	36	80.00	9	20.00
Which device can be used during Basic Life Support?	15	33.33	25	55.56	41	91.11	4	8.89
Which procedure is incorrect when the airway is obstructed by a foreign body?	28	62.22	17	37.78	43	95.56	2	4.44

Note: Percentage of rows used

For the question "If defibrillation will be applied to the patient during adult advanced life support and the amount of energy recommended by the device is unknown, how many joules should be preferred?"; the correct response rate increased from 15.91% in the pre-test to 92.05% in the post-test (Table 3). As a result, it is seen in Table 3 data that the level of knowledge of the participants increased significantly with the training.

Table 3. Distribution of participants' responses to advanced life support test questions.

Distribution of Responses to Advanced Life Support Test Questions (n=88)	Pre-Test				Post-Test			
	That's right		Wrong		That's right		Wrong	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
What should be the dose and form of adrenaline administration in anaphylaxis in adult patients?	17	19.32	71	80.68	68	77.27	20	22.73
What should be the frequency of adrenaline administration during adult CPR?	70	79.55	18	20.45	83	94.32	5	5.68
Which of the following drugs is not administered by reconstitution with SF?	24	27.27	64	72.73	78	88.64	10	11.36
When is Amiodarone used in adult advanced life support?	39	44.32	49	55.68	84	95.45	4	4.55
Which of the above rhythms can be defibrillated?	62	70.45	26	29.55	84	95.45	4	4.55
Which of the following information about adult advanced life support is incorrect?	42	47.73	46	52.27	80	90.91	8	9.09
What is the in-hospital code blue number?	85	96.59	3	3.41	88	100.0	0	0.00
Which of the following options is not among the reversible causes in adult advanced life support?	36	40.91	52	59.09	84	95.45	4	4.55
If the defibrillation procedure will be applied to the patient during adult advanced life support application and the amount of energy recommended by the device is unknown, how many joules should be preferred?	14	15.91	74	84.09	81	92.05	7	7.95
How often should pulse control be performed during cardiopulmonary resuscitation?	33	37.50	55	62.50	83	94.32	5	5.68

Note: Percentage of rows used.

In Table 4, the results of the Wilcoxon test were presented to evaluate the difference between the pre-test and post-test results of the participants. While the mean score before the training (pre-test) was 5.47, the mean score after the training (post-test) was found to be 9.18. Standard deviation values show that the post-

test was more homogeneously distributed. Z and P values confirm that the training program was effective. The knowledge level of the participants increased with the training.

Table 4. Wilcoxon test between basic life support pre-test and post-test results.

	n	Average	Standard Deviation	Minimum	Maximum	**Z	*p
First Test	45	5.47	2.42	1	10	-5.609	0.00
Post Test	45	9.18	1.03	5	10		

*p: <0.05 statistically significant,**z: below average (-), above average (+)

In Table 5, while the average score before the BLS training (pre-test) was 4.81, the average score after the training (post-test) was found to be 9.28. This shows that the training program significantly increased the knowledge level of the participants. Z and P values confirm that the training program was effective.

Table 5. Wilcoxon test between advanced life support pre-test and post-test results.

	n	Average	Standard Deviation	Minimum	Maximum	**Z	*p
First Test	88	4.81	1.73	1	10	-8.087	0.00
Post Test	88	9.28	1.23	4	10		

*p: <0.05 statistically significant,**z: below average (-), above average (+)

DISCUSSION

In-hospital cardiac arrest and out-of-hospital cardiac arrest are global health problems. In the prevention and treatment of cardiopulmonary arrest, it is known that it is very important for healthcare professionals to have sufficient knowledge and skills about Basic Life Support (BLS) and Advanced Life Support (ALS). Current guidelines and studies show that early initiation of CPR increases survival (Baskett P, 2008), and performing CPR by people who do not have sufficient knowledge and experience increases mortality. Therefore, all healthcare workers should be able to recognize cardiopulmonary arrest, call for help and start CPR early and effectively. If they do not have sufficient knowledge on this subject, the chance of saving any patient decreases (Madden, 2006). In our study, it is shown that the knowledge and skill levels of the participants increased significantly with BLS and ALS training programs.

This difference between the pre-training and post-training tests clearly demonstrates the effectiveness of the trainings. For the questions "What is Basic Life Support?" and "How to make the most accurate respiratory assessment in the application of basic life support?" asked in our training questionnaire, the correct response rates increased to 97.78% in the post-test, indicating that the participants better understood the basic concepts. The pre-test results show that the participants initially had some significant knowledge gaps in basic life support. In another question "How many times per minute should CPR be performed in adults?", the correct response rate was 46.67% in the pre-test, but this rate increased to 93.33% in the post-test, which demonstrates how effective the training program was in helping the participants learn the correct practices. In addition, the correct response rate for the question "How many cm should the sternum go down during CPR for adults?" increased from 24.44% in the pre-test to 86.67% in the post-test, which shows that critical details and practices were adopted and learned by the participants during the training process. In the question "What should the dose and form of adrenaline administration in anaphylaxis be in adult patients?", the correct response rate was 19.32% in the pre-test, yet it increased to 77.27% in the post-test. This shows how effective the training program was in helping the participants learn the critical information. On the other hand, in the question "When is Amiodarone used in adult advanced life support?", the correct response rate increased from 44.32% in the pre-test to 95.45% in the post-test. This result shows that the knowledge level of the participants on critical drug use and timing of administration increased significantly. Similarly, in the question "If defibrillation will be applied to the patient during adult advanced life support application and the amount of energy recommended by the device is unknown, how many joules should be preferred?", the correct response rate increased from 15.91% in the pre-test to 92.05% in the post-test. This shows that the knowledge level of the participants about the correct application of the defibrillation procedure has increased significantly.

In our study, most of the participants in the training were nurses. In the studies conducted, auxiliary healthcare worker, especially nurses, are the first people to encounter cardiopulmonary arrest and if they are not competent in this regard, the chance of saving patients decreases (Madden, 2006; Herlitz, 2005). Therefore, it is recommended that both healthcare and allied healthcare worker receive CPR training. 58.9% of health care workers were found to follow current CPR information (Josipovic , 2008). In the study by Çelikli et al. in 2012, the rate of healthcare workers following current BLS

information was found to be 34.7% and it was emphasized that it is important to update the level of knowledge (Çelikli et al., 2012). In our study, although there was a group of healthcare workers who had received previous training, it was observed that the rate of following current information was low in accordance with the literature. As a result, it was observed that the participants were less likely to follow current information, and they should keep their CPR knowledge and skills up to date with theoretical and practical applications. Therefore, repeating CPR and IED training programs at regular intervals will ensure that knowledge and skills are kept up to date.

As in the rest of the world, the proportion of people trained in CPR/ICCA is low in our country (Pehlivan M, 2019) In 2019, the International Liaison Committee on Resuscitation (ILCOR) launched a worldwide initiative to increase overall survival rates with the words "Every citizen of the world can save a life - CHECK-CALL-PRESS" (Böttiger, 2020). In previous studies, it has been observed that participants who are not health specialists have a desire to receive and apply CPR training (Demirkıran, 2003). In the study conducted by Özdinç et al. in 2014, significant increases were observed in the knowledge levels of police candidates after CPR training programs. In the study conducted by Demirkıran et al. in 2003, significant increases were observed in the knowledge levels of first-year medical faculty students after CPR training programs (Demirkıran et al., 2003). In our study, it was observed that the knowledge level of health support personnel, especially nurses, who received training increased after the training. In the study by Kaan et al. in 2010, the rate of performing BLS applications in the correct order increased after the training and it shows that healthcare worker need continuous trainings to maintain and increase their knowledge levels (Kaan NM, 2010). In our study, unlike other studies, ALS was also given at the same time, and a significant increase was observed in the level of knowledge and skills after the training. As seen in the study by Tuncar and Beştemir (2022), it is emphasized that success rates increase with ALS training, and how important the trainings are (Tuncar, 2022)

In the study of Yalçın et al. (2020), the increase in the level of knowledge of the health and health support personnel working in the emergency department was evaluated, and while there was no significant difference in the knowledge levels of specialist and general practitioners and emergency medical technicians before and after training, a significant difference was found in other occupational groups after training (p<0.05) (Yalçın, 2020). In addition, a Danish study has shown a significant association between mandatory CPR training provided to the community and survival (Jensen, 2023).

In a study conducted in Switzerland, it was reported that 19% of the population received basic life support training (UK, 1998).

The content and application methods of CPR and IBA training programs play a critical role in the knowledge and skill acquisition of participants. In a study conducted at Ege University, it was reported that the rate of responding correctly to the content of CPR applications differed according to the field of study (p<0.001) (Özdinç, 2014).

This shows that the content of training programs should be shaped according to the needs and professional requirements of the participants.

Limitations

The limited number of participants in the study and the fact that it was conducted in a single center constitute the limitations.

CONCLUSION

Basic life support and advanced life support can be encountered in all areas of life. Not only healthcare professionals but also all segments of the society need to learn especially CPR. According to the results of our survey, it is seen that the majority of healthcare professionals have inadequate knowledge about BLS and ALS, but with the trainings given and planned to be given in the future, it will provide a significant increase in their level of knowledge. As a result, repeating training programs at regular intervals will contribute to the preservation and updating of knowledge and skills. In addition, it will be useful to increase awareness about the subject by providing training to a wider population with participation from different professional groups and different segments of society.

Conflict of Interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions

Plan, design: RK, MF; **Material, methods and data collection:** MF, RK, MÇ, BÖ; **Data analysis and comments:** RK, SS; **Writing and corrections:** BÇ, MF.

Ethical Approval

Institution: Balikesir University Health Sciences Non-Interventional Ethics Committee
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