



The Evaluation of Burn Knowledge and Burn Management Skills of Resident Doctors of Emergency Medicine, General Surgery and Plastic Surgery

Acil Tıp, Genel Cerrahi ve Plastik Cerrahi Asistanlarının Yanık Bilgisi ve Yönetim Becerisinin Değerlendirilmesi

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Abstract

Aim: Our study aimed to assess the abilities of emergency medicine, general surgery, and plastic surgery resident doctors in diagnosing, treating, and managing burn patients.

Material and Method: We conducted a survey study between 04.05.2015 and 04.08.2015 at university hospitals and training and research hospitals in Ankara. We collected information on the age, gender, experience, and hospital of the doctors, as well as their training and approaches to treating burn cases. We evaluated their knowledge in various areas, including clinical approaches to 2nd and 3rd-degree burn cases, escharotomy localizations, intubation indications, bulla treatment, referral and hospitalization indications, identification of inhalation burns, and fluid resuscitation.

Results: The average age of the participants was 29.3±2.4 years, and 65.7% were male. We found that doctors who had received advanced burn life support training had better approaches to burn cases. We also observed a positive correlation between age and approaches to cases, escharotomy localizations, and referral indications. Additionally, there was a positive correlation between the duration of residency and approaches to burn cases, clinical application to 2nd and 3rd-degree burn cases, escharotomy localization, intubation indications, indications of bulla treatment, referring indications, hospitalization indications, and approaches to inhalation burn.

Conclusion: Our study revealed that doctors' knowledge about assisting burn patients was insufficient in the early stages of their training. However, this improved as the duration of their residency increased. We believe that burn training and advanced life support courses can facilitate the diagnosis and treatment of burn patients more effectively.

Keywords: Burn, medical training, emergency medicine, general surgery, plastic surgery

Öz

Amaç: Biz bu çalışmada Ankara'daki acil tıp, genel cerrahi ve plastik cerrahi kliniklerindeki asistan doktorların, anket soruları ile yanık bilgilerini ve yönetim becerilerini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Bu çalışma 04.05.2015- 04.08.2015 tarihleri arasında Ankara'daki üniversite ve araştırma hastanelerinde anket çalışması olarak yapıldı. Hekimlerin yaş, cinsiyet, hekimlik süresi, asistanlık süresi, çalıştıkları hastane, aldıkları eğitimler ve vakalara yaklaşımları belirlendi. Hekimlerin 2. ve 3. derece yanık vakalarındaki klinik uygulamalar, eskarotomi alanı, entübasyon endikasyonu, büllere müdahale, sevk ve yatış endikasyonları, inhalasyon yanığını tanıma, yanıkta sıvı resusitasyonu konusundaki bilgileri değerlendirildi.

Bulgular: Katılımcıların yaş ortalaması 29.3±2.4 yıl ve %65.7'si erkekti. İleri Yanık Yaşam Desteği eğitimi alan hekimlerin vakalara yaklaşım ve klinik bilgilerinin daha iyi olduğu saptandı. Yaş ile vakalara yaklaşım, eskarotomi lokalizasyonu ve sevk endikasyonu bilgisi arasında pozitif yönlü korelasyon saptandı. Asistanlık süresiyle; yanık vakalarına yaklaşım, 2. ve 3. derece yanık vakalarında klinik uygulama, eskarotomi lokalizasyonu, entübasyon endikasyonları, büll tedavi endikasyonları, sevk endikasyonları, yatış endikasyonları ve inhalasyon yanıklarına yaklaşım arasında pozitif yönlü korelasyon saptandı.

Sonuç: Çalışmamız hekimlerin yanık müdahalesi konusunda bilgilerinin yeterli olmadığını göstermiştir. Verilecek yanık eğitimleri ve ileri yanık desteği kursları ile yanık hastalarında tanı ve tedavi süreci daha başarılı bir şekilde gerçekleştirilecektir.

Anahtar Kelimeler: Yanık, tıp eğitimi, acil tıp, genel cerrahi, plastik cerrahi



INTRODUCTION

Burn is described as a kind of physical injury resulting from tissue contact with materials with higher or lower temperatures than the tissue's own temperature, such as burning chemicals, electrical current, and radioactive beams. Burns are commonly observed traumas in developed and developing countries.^[1,2] According to the parameters of the World Health Organization (WHO), every year around the world, 2.5 million people are affected by burns, and 300.000 people die of reasons based on the burn and associated with burns.^[3]

Almost half of the burn cases are pediatric patients.^[4] The most common causes of burns include scalding, flame, electrical, and chemical burns, respectively. These burns usually affect the upper and lower extremities, with second-degree burns being the most common. About half of all burn cases can be treated with dressings, while others may require surgery. Unfortunately, burns have a mortality rate of around 6-7%, with sepsis and inhalation burns being the most common causes of death.^[5] It is essential to avoid unconscious interventions by families, such as applying yogurt or toothpaste, as these can significantly increase the risk of mortality and morbidity.^[5,6]

Medical contact with patients with burns starts in the emergency department (ED). Most patients can be treated by doctors in primary and secondary care hospitals' EDs. The age of the patients, the width and the depth of the burn, the reason for the burn, and the intervention in the first few hours affect the prognosis of the burn at a large scale.^[5,7] ED doctors must know the surface of the burn area, referring criteria, airway control, intubation indications, fluid resuscitation, and emergency interventions for the burn. They must apply their knowledge to the patients in the best way.

In our country, in some hospitals, patients with burns are primarily given medical interventions by ED doctors, and then the treatment is continued by general surgery and plastic surgery doctors. In some other hospitals, the treatment is carried out by the clinic doctor (general surgeon/plastic surgeon), who has continued the treatment since the first intervention with the patient. The knowledge and competence of the medical staff to intervene in the burn significantly affects the mortality and morbidity of the patients.^[1,6,7]

In this study, we used a survey to evaluate the burn knowledge and burn management skills of emergency medicine, general surgery, and plastic surgery residents who had trained in Ankara.

MATERIAL AND METHOD

This prospective study was performed in Ankara Training and Research Hospital on 29.04.2015, dated 4886, numbered ethics committee approval of Ankara Training

and Research Hospital. The study was conducted according to the last version of the "Helsinki Declaration" and "Good Clinical Practice Instruction." The study was carried out by the emergency medicine, general surgery, and plastic surgery residents of Ankara Training and Research Hospital, Ankara Training and Research Hospital, Keçiören Training and Research Hospital, Atatürk Training and Research Hospital, Dışkapı Training and Research Hospital, Gazi University School of Medicine, Hacettepe University School of Medicine, and Ankara University School of Medicine between the dates 04.05.2015 – 04.08.2015.

Other residents, besides those in emergency medicine, general surgery, and plastic surgery, were excluded from the study. Only the volunteer residents were included because the study was based on voluntariness. A total of 166 residents participated in the study. Of these, 90 were emergency medicine residents, 41 were general surgery residents, and 35 were plastic surgery residents. The residents were given a survey that had three parts. The first part of the survey included a demographic area that questions age, gender, the duration of their professional life as a doctor and as a resident, the hospital where they work, and the residency training they had; the second part included 2 cases in order to assess the doctors' case evaluation; the third part includes 10 test questions to evaluate the knowledge level of the doctors. The questions in the third part were associated with their clinical practice of 2nd and 3rd-degree burn cases, emergency interventions for 2nd and 3rd-degree burns, escharotomy field, intubation indications, interventions to bullas, referring criteria, hospitalization indications, recognition of inhalation burn, given fluid and the follow-up of the given fluid.

The case questions were evaluated by eight specialists (4 emergency medicine specialists, three general surgery specialists, and one plastic and reconstructive surgery specialist) concerned about burns and working at three training and research hospitals with burn centers and burn units. The accurate calculations of the burn percent in the cases were determined by the agreement of those specialists. For total body surface (TBS), average value and standard deviation (SD) were calculated. The average predicted percent was calculated by experts as 28.37 ± 2.55 and 14.87 ± 1.72 for the first and second cases, respectively. In order to gain the correct percent, three values below and above in the SD were considered. Therefore, acceptable values were 21-36% for the 1st and 10-20% for the second cases. Calculations on evaluating essential fluid needs in the cases were performed with the doctors' estimated percent. The fluid need was based on the Parkland formula.^[8]

The parameters were analyzed by SPSS for Windows version 23.0. SD was used to express the average descriptive statistics of continuous variables; numbers and percentages were used to express categorical variables. The distributions of the variables were assessed with the Kolmogorov-

Simirnov test. Mann Whitney U and Kruskal Wallis tests were utilized in the analyses of numerical non- parametric parameters. The chi-square test was used in the analysis of categorical parameters. The Spearman Correlation test was used to evaluate the association of permanent parameters. $p < 0.05$ was accepted to be statistically significant.

RESULTS

Our study involved 166 doctors aged 25-37 years, with an average age of 29.3 ± 2.4 years. Of the total number of doctors included in the study, 106 (65.7%) were male, while 57 (34.3%) were female. On average, the doctors had been practicing medicine for 48.3 ± 25.9 months, with a range of 10-144 months, and had completed their residency programs for an average of 29.3 ± 15.2 months, with a range of 7-66 months. Out of the participating doctors, 90 (54.2%) were emergency medicine residents, 41 (24.7%) were general surgery residents, and 35 (21.1%) were plastic surgery residents. Sixty percent (100) of the doctors worked at training and research hospitals, while the rest (39.8%) worked at university hospitals. Moreover, 14.5% (24) of the doctors had received ABLS (Advanced Burn Life Support) or burn management training. In comparison, 50.6% (84) had taken ACLS / ATLS / APLS (Advanced Cardiac/Trauma/ Pediatric Life Support) or any other life support course (Table 1).

Table 2 compares the average values of the doctors' correct answer percentages to the questions that evaluate their burn management skills with regard to their branches and the type of hospital they work in. Correct answer percentages for burn management skills were similar in every three branches (Table 2). Calculating the fluid need concerning burn area and knowledge levels in diagnosing inhalation burn was better in training and research hospitals than in university hospitals. The comparison of training and research hospitals and university hospitals regarding other criteria was similar.

Regarding the level of competence in burn management knowledge concerning the residents' training, it was seen

that the ones who had ABLS training had better levels of knowledge at all steps (Table 3). When examining the presence or absence of ACLS/ATLS/APLS training, the doctors who received those training appeared to perform primary interventions more effectively upon initial assessment, calculating the essential fluid need and its follow-up, specific intubation indications, intervention to bullas, and indications of hospitalizations. However, the doctors were trained to perform similarly in calculating burn percentages, escharotomy, referring indication, and identifying inhalation burns (Table 3).

Table 4 shows the correlation between a doctor's age and duration of professional life as a doctor and a resident and his/her correct response percentages at burn management steps. There was a positive, meaningful correlation between the duration of residency and other burn management skills, apart from primary must interventions at first impression. However, this correlation was identified as weak (Table 4).

Table 1. Demographic data

	Mean±SD / n(%)
Age (year)	29.3±2.4
Gender	
Male	109 (65.7)
Female	57 (34.3)
Duration of work as a doctor (months)	48.3±25.9
Duration of work as a resident doctor(months)	29.3±15.2
Proficiency	
Emergency medicine	90 (54.2)
General surgery	41 (24.7)
Plastic and reconstructive surgery	35 (21.1)
Hospital type	
Training and Research Hospital	100 (60.2)
University Hospital	66 (39.8)
Attended Education	
ABLS	24 (14.5)
ACLS/ATLS/APLS	84 (50.6)

* SD: Standard deviation

Table 2. The knowledge of burn management according to proficiency and hospital type

	Total	Proficiency of the doctor			P	Hospital type		
		Emergency medicine	General surgery	Plastic and reconstructive surgery		Training and Research Hospital	University Hospital	P
Things to do at the first look	70.8	69.0	71.5	74.5	0.543	71.96	69.00	0.383
Calculation of total burn area	48.2	43.3	51.2	57.1	0.346	67.5	32.5	0.965
Calculation of the need of fluid	48.8	47.8	46.3	54.3	0.756	72.8	27.2	0.001
IV fluid selection	66.3	58.9	73.2	77.1	0.086	62.7	37.3	0.359
IV fluid follow up	79.5	82.2	75.6	77.1	0.634	62.1	37.9	0.329
Escharotomy	44.7	42.2	45.7	50.0	0.576	45.75	43.18	0.653
Intubation indication	76.7	75.9	76.3	79.5	0.659	77.80	75.15	0.361
Management of bullas	76.8	75.9	76.7	79.5	0.658	77.80	75.41	0.367
Referring indication	70.6	67.3	73.1	76.2	0.061	72.05	68.39	0.524
Hospitalization indication	58.7	58.7	56.6	61.1	0.733	61.20	54.85	0.150
Diagnosis of inhalation burn	72.8	71.3	73.9	75.5	0.462	75.71	68.39	0.022

Table 3. The knowledge of management of burn according to taking the ABLS, ACLS, ATLS and APLS training programs

	ABLS training program			ACLS/ATLS/APLS training programs		
	No	Yes	p	No	Yes	p
Things to do at the first look	67.7	88.8	<0.001	65.98	75.48	0.015
Calculation of total burn area	41.5	87.5	<0.001	42.7	53.6	0.160
Calculation of the need of fluid	40.8	95.8	<0.001	34.1	63.1	<0.001
IV fluid selection	62.7	87.5	0.017	62.2	70.2	0.273
IV fluid follow up	76.8	95.8	0.032	70.7	88.1	0.006
Escharotomy	37.5	87.5	<0.001	39.02	50.30	0.065
Intubation indication	75.0	87.0	<0.001	73.41	80.00	0.022
Management of bullas	75.1	87.0	<0.001	73.62	80.00	0.023
Referring indication	67.5	88.7	<0.001	68.89	72.26	0.161
Hospitalization indication	53.8	87.5	<0.001	51.95	65.24	0.005
Diagnosis of inhalation burn	69.9	89.9	<0.001	70.10	75.44	0.191

Table 4. The correlation of burn management knowledge with the age, duration of duration of professional life as a doctor and as a resident

	Age		Duration of professional life as a resident		Duration of professional life as a doctor	
	r	p	r	p	r	p
Things to do at the first look	-0.032	0.687	0.087	0.263	-0.196	0.011
Escharotomy	0.273	<0.001	0.202	0.009	0.110	0.159
Intubation indication	0.026	0.735	0.200	0.010	-0.012	0.875
Management of bullas	0.025	0.748	0.201	0.009	-0.013	0.866
Referring indication	0.192	0.013	0.271	<0.001	0.098	0.211
Hospitalization indication	0.192	0.064	0.222	0.004	0.087	0.265
Diagnosis of inhalation burn	0.192	0.359	0.203	0.009	0.031	0.689

DISCUSSION

Burn cases are a group of diseases that can affect people of any age, but 50% of cases are observed in childhood and can lead to severe morbidity and mortality. A recent study found that emergency medicine residents, as well as general surgery and plastic surgery residents, who are often the first medical professionals to encounter burn patients, may have insufficient knowledge in the early stages of their residency. However, their level of knowledge increases with the duration of their residency training. The study also revealed that ABLS training provides crucial information about the appropriate intervention for burn patients, while ACLS/ATLS/APLS training covers some related topics.

According to numerous studies, proper fluid therapy, escharotomy, intubation, and other interventions significantly reduce burn mortality rates.^[9] However, incompetency of the staff in burn management skills was reported in some earlier studies.^[10,11] In their study, Baartmas et al. evaluated TBS and fluid need in children; exaggerations in TBS were observed; for that reason, the given fluid amount was identified to be miscalculated in 71.4% of the patients.^[12] In their study, Breederveld et al. indicated that the patients' TBS was miscalculated, and, therefore, the fluid was given inaccurately, which meant that patient management was incompletely performed (10). Smith et al. indicated that TBS was miscalculated at a severe rate, such as 50%.^[11] Freiburg et al. reported that burns smaller than 20 % were expressed as 4.3 % of a more significant rate; burns larger than 20%

were stated as 4.9% of a more significant rate.^[13] Another study showed that only one-fourth of the doctors calculated the appropriate TBS amount and got started with the appropriate fluid amount. Similar to earlier studies, our study also detected TBS miscalculations at a rate of 51.8 % and fluid need miscalculations at a rate of 51.2%.

When the extremity circulation of burn patients is imperiled, an escharotomy is done to the extremity. If the eschar resulting from the burns around the neck and chest restricts breathing mechanically, an escharotomy is done. Escharotomy areas are the anterior axil line, bottom elevation line on the chest wall anterior or second and third elevation level, and medial and lateral longitudinal lines of extremities

In our study, doctors' knowledge of the necessity of escharotomy and localization was 44.7%. No similar study that displays the knowledge level of escharotomy could be found.

In severe inhalation burns, findings that develop the necessity of intubation are severe and continuous cough, respiratory tract obstructions, and deep or full-thickness burns around the neck. Severe burns in the mouth and nose can cause swelling in the oropharynx, mental impairment, clouded consciousness (often from drug and alcohol abuse), difficulty breathing, hypoxia, and hypercapnia.^[15] In our study, the proper response level to specific intubation indications was an average of 76%. After an extensive search, no studies were found that have examined doctors' knowledge of intubation indications in burn cases.

In the treatment of bullas, a consensus could not be provided. Some researchers argue that bullas should not be removed. Some others argue that bulla should be removed from their skin. Also, some argue that the fluid in the bullas should be aspirated and the skin should be kept with medical dressing. A generally accepted rule is that if bullas are smaller than 6-8 cm and have not been ruptured, they should not be touched. The inside of the bigger ones can be emptied or cleaned after being ruptured. The bullas in the palm and the plantar are not generally ruptured.^[16-18] The average knowledge level of the doctors included in the study about bulla treatment was 76.8%.

Clinical conditions of burn patients sometimes necessitate hospitalization and intensive unit care. Intensive unit care departments exist in very few centers, especially for burn patients. Patients who need to be hospitalized in intensive unit care are more frequently referred to those centers. However, patients with mild symptoms and patients who should be followed in the clinic may also need to be referred to those burn centers. The average level of physician knowledge of correct referral indications was 70.6% in our study. Baartmas et al. expressed that 86.3-89.2% of the referring criteria of the children are met.^[12] Carter et al. reported an 88% accuracy in adult referring criteria.^[19]

To the best of our knowledge, no study comparing resident doctors' knowledge about burns at tertiary healthcare services (between training and research hospitals and university hospitals) has been identified in the literature. In our study, doctors' burn management skills and knowledge levels do not show differences based on their branches. However, their knowledge level about calculating the essential fluid needed and diagnosing inhalation burns was higher in teaching and research hospitals.

Fathuldeen AA et al. assessed the knowledge of burn first aid among healthcare workers (specialists, consultants, and residents) and found that education level, specialty, professional experience, and participation in burn management courses did not significantly affect the burn management skills of physicians.^[20] Also, Breederveld et al. stated that staff training about burns was better in some areas of case management. However, when all the categories were evaluated, there was no difference between the ones who had training and those who did not.^[10] The training was reported to decrease the period of fluid treatment, referring criteria, and period of acceptance to a burn center.^[21-23] Rogers et al. stated that staff that had ABLs training had a more practical approach toward burn patients.^[24] In our study, the doctors with ABLs training had a better approach to the cases, better burn management skills, and higher levels of knowledge at every step. The fundamentals of critical care are conveyed during ABLs training. For that reason, having the training is identified to create an apparent difference. Van Olden et al., in their two studies, stated that ATLS training would positively affect the burn patients' survival rate.^[25,26] Rogers et al. expressed that

courses such as ABLs and ATLS had similar results.^[24] Smith et al. stated that doctors who had training in ACLS and essential life support had a better approach to patients with severe conditions.^[27] In his study, Ramakrishnan emphasized that doctors practicing on pediatric burn patients should get APLS training.^[28] In our study, doctors who had training in ACLS/ATLS/APLS or any life support course were seen to have more competency at doing the necessary intervention at first impression, calculating the essential fluid need and its follow-up, specific intubation indications, interventions to bullas and hospitalization indications. However, despite their training, doctors showed similar results in calculating burn percent, escharotomy, referring indication, and inhalation. ACLS/ATLS/APLS training provided competency in common training subjects associated with some steps of burn management, but they had deficiencies only particular to burn management.

Doctors who had ABLs training displayed significantly different levels of knowledge at all steps, showing the benefits of special training in burns. This finding agrees with Lam NN et al.'s statement that physicians who had previously attended training courses had significantly higher knowledge levels than others.^[29]

In our study, there were positively significant correlations between other burn management skills except for the duration of residency and interventions done at a first impression. However, those correlations were weak. Despite Fathuldeen AA et al. and Lam NN et al. state that working experience did not significantly affect knowledge level, in our study, there is a relationship between prolonging the residency period and having higher competency in burn management.^[20,29] That is because residents can practice what they have learned in primary burn education by treating, following up, and managing patients.

CONCLUSION

Based on the data obtained from the study, it was found that the residents needed to be adequately trained to handle burn patients in the initial stages of their practice. However, their level of expertise increased as they gained more experience. Moreover, it was observed that ABLs Training makes an apparent difference in burn management. Doctors working at healthcare centers where burn admissions are frequent should undergo ABLs training, which contributes significantly to decreased mortality and morbidity in burn patients. Furthermore, obtaining ACLS/ATLS/APLS training can benefit residents when dealing with burn patients. Hence, we suggest that it would be advantageous to complete the training earlier to enhance the knowledge base concerning burns. Additionally, diagnosis and therapy in patients with burns will be achieved more successfully, owing to burn training and advanced life support courses, which will be provided.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ankara Training and Research Hospital Ethics Committee (Date: 29.04.2015, Decision No: 4886).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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