ORIGINAL ARTICLE

Approaches of 112 ambulance service staffers to children with burns: A survey assessment

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ABSTRACT

BACKGROUND: We aimed to evaluate the knowledge of 112 ambulance service staffers (doctors, nurses, emergency medical technicians [EMTs], and paramedics [PMs]) who were the first intervention to pediatric patients with burn injuries regarding first intervention and patient transfer.

METHODS: The study included 373 personnel working in 112 ambulance services in Ankara province. Participants were asked 17 questions to measure their knowledge of burns in children. Statistical analysis was performed with the Statistical Package for Social Sciences 21.0.

RESULTS: Of the participants, 26 (7%) were doctors, 25 (6.7%) nurses, 180 (48.3%) EMTs, and 142 (35.3%) PMs. Of the participants, 118 stated that they always calculate the burn surface area, while only five (1.3%) marked the correct choice of the Lund Browder scheme to the question by which method they calculated. One hundred twenty one personnel (32.4%) use the Parkland formula to calculate the amount of fluid to be given during transfer while only 7 (1.9%) use the Galveston formula, which is more suitable for children. Of the participants, 56 (15%) answered as lactated Ringer's solution which is the correct fluid to the question of which fluid do you give at the scene and during the transfer. One hundred fifty-three participants (41%) responded correctly to the scenario question expected to recognize inhalation damage while only 138 (37%) responded correctly as "I do immediately intubate" to the inhalation injury described scenario question. One out of 373 (0.3%) participants marked the appropriate procedure for a patient who had a 50% scald burn during the first intervention and transfer. The rate of topical lidocaine use of participants was high (70.8%). Of the 373 participants, only 33 (8.8%) thought themselves competent for first aid and transfer of children with burns. If training on the subject was held, 333 personnel (89.3%) wanted to participate.

CONCLUSION: It is expected that the knowledge of 112 ambulance services who see pediatric burn patients first, perform the first intervention, and provide transfer would be suitable. However, our questionnaire shows that these personnel have insufficient knowledge and need to be trained.

Keywords: Ambulance; burn; children; doctor; emergency medical technician; nurse; paramedic; transfer.

INTRODUCTION

Burns are a common form of trauma that causes mortality and morbidity in adults and children.[1] Due to advances in the treatment of burns in the last half century, mortality rates from burns have significantly declined. Effective resuscitation in the early stage, advances in surgical techniques, control of infections with antibiotics, an increase in the number and facilities of burn centers, and advances in nutritional support have all made a difference. The role of ambulance services is also important because patients are transferred from the accident scene to the hospital more quickly and under more favorable conditions than in the past.

Cite this article as: Demir S, Bostancı SA, Erturk A, Öztorun Cİ, Güney D, Azili MN, et al. Approaches of 112 ambulance service staffers to children with burns: A survey assessment. Ulus Travma Acil Cerrahi Derg 2022;28:447-455.

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Ulus Travma Acil Cerrahi Derg 2022;28(4):447-455 DOI: 10.14744/tjtes.2020.91045 Submitted: 16.03.2020 Accepted: 22.12.2020

Pre-hospital emergency medical services in Turkey have made great progress in the last decade. Ground ambulances, air ambulances, marine ambulances, and motorcycle ambulances are dispatched to pre-hospital patients within the general directorate of the emergency health services of the Ministry of Health. As well as doctors and nurses, emergency medical technicians (EMTs) and paramedics (PMs) have been working in ambulances since 2004. As with all trauma cases, burn victims are transferred from the scene of the injury to the hospital by ambulance teams. Ambulance staffers manage the treatment of patients for hours, particularly in the case of out-of-town transfers.

It should be expected that the ambulance staffers who first see patients, apply first interventions, and make hospital transfers will have sufficient knowledge to treat burn victims. Incomplete or incorrect interventions in the treatment of burn victims during transfer have a direct effect on a patient's mortality and morbidity. A study conducted in Turkey by Senayli et al.[2] found that only 8% of patients referred to burn centers were referred correctly, and at least one mistake was found in the transfers of other patients.

This study will assess the knowledge of ambulance staffers during the first intervention and transfer of burned children.

MATERIALS AND METHODS

This survey was conducted to obtain the demographics of the participants and to assess their knowledge of the immediate intervention in pediatric burns, and recognition and management of inhalation injury. Ethics approval was obtained from the Ankara Children's Health and Diseases Hematology Oncology Training and Research Hospital Clinical Research Ethics Committee (No. 2019/143), and the required permission to conduct the survey was received from the Ankara province Health Directorate, Emergency Medical Services Department. The survey was applied to personnel working in ambulance services in Ankara province.

The participants were asked 17 questions. The first three questions asked about their profession (doctor, nurse, PM, or EMT), how long they had worked in the ambulance service, and whether they had received burns training. Twelve further questions evaluated the participants' knowledge of first interventions for burned children, total burned body surface area (TBSA) calculations, appropriate fluid treatment, appropriate approaches to burn wounds, recognition of inhalation injuries, and patient transfer protocols. The final two questions asked whether participants felt competent in the intervention and transfer of burned children and whether they would like to participate in further training (the survey questions are provided in Appendix 1).

Scenarios related to different clinical tables were designed, and questions about these scenarios were asked. In the first and second scenarios, respondents were evaluated according to whether they correctly diagnosed inhalation injury and intubated the patient in time. In the third scenario, participants were asked what should not be done during the transfer of pediatric major burn patients.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) software version 21 (SPSS Inc., Chicago, IL, USA). The numerical variables were investigated using visual methods and analytical methods (Kolmogorov-Smirnov or Shapiro-Wilk tests) to determine whether or not they were normally distributed. Descriptive analysis of non-normally distributed numerical variables was performed with the Kruskal-Wallis test. Categorical variables were evaluated using the chi-square test. For this, the percentages of correct answers from participants were found first. Then, the groups were compared using the Chi-square test. For all variables, $p<0.05$ was considered significant.

RESULTS

A total of 419 staffers from 112 ambulance services participated in the survey; 46 participants (11.0%) were excluded from the study because they did not answer the question identifying their profession. The data from the remaining 373 participants were evaluated. Twenty-six (7.0%) participants were doctors, 25 were nurses (6.7%), 180 EMT (48.3%), and 142 PM (38.1%).

The mean length of work of the doctors in the ambulance service was 4.53 years (min–max; standard deviation: 0.6–24; 5.98); for the nurses, it was 10.88 years (0.0–26.0; 8.60); for the EMTs it was 8.41 years (0.0–16.0; 4.0); and for the PMs it was 7.09 years (0.0–16.0; 4.24). The demographic data of the participants are presented in Table 1. The four groups presented differences in terms of length of work in the ambulance service ($p<0.001$) (Table 1). Nurses had been involved for the longest.

Only 104 participants (27.9%) stated that they had undertaken burns training. Of these, only 68 (18.2%) stated they had been trained to treat pediatric burns. All stated that they received burns training in the Advanced Life Support Course (ALS) or Pediatric Advanced Life Support Course (PALS). There was no difference between the groups in terms of burns training (p values 0.40 and 0.89, respectively) (Table 1).

Only 118 (31.6%) of the participants reported that they always calculated the TBSA of patients at the scene and during the transfer, while 14 (3.8%) stated that they never calculated it. The majority of respondents (72.9%; 271/373) stated that they calculated the TBSA by the rule of nines, but only five (1.3%) stated that they used the Lund-Browder scheme, which is the correct method for children with burns. There was no difference between the groups ($p=0.98$ and $p=0.69$, respectively) (Table 2, Questions 1 and 2).

Table 1. Demographic data of the participants

Question		Doctor (n=26) (%)	Nurse (n=25) (%)	EMT (n=180) (%)	PM**** (n=142) (%)	p	All (n=373) (%)
1. The mean length of work in the ambulance services	Mean/Year (Min-Max; Std. Dev.)	4.53 (0.6–24.0;5.98)	10.88 (0.0–26.0;8.60)	8.41 (0.0–16.0;4.01)	4.53 (0.0–16.0;4.55)	<0.001*	6.92 (0.0–26.0;5.23)
2. Have you received burn training?	Yes	10 (38.5)	9 (36.0)	50 (27.8)	35 (24.6)	0.40**	104 (27.9)
	No	16 (61.5)	16 (64.0)	129 (71.7)	105 (74.7)		267 (71.6)
	No answer	0	0	1 (0.6)	1 (0.7)		2 (0.5)
3. Have you received training on children burns?	Yes	5 (19.2)	5 (20.0)	35 (19.4)	23 (16.2)	0.89**	68 (18.2)
	No	21 (80.8)	20 (80.0)	144 (80.0)	118 (83.1)		303 (81.2)
	No answer	0	0	1 (0.6)	1 (0.7)		2 (0.5)
4. Do you feel yourself competent about first aid and transfer of burned children?	Yes, I feel fully sufficient	3 (11.5)	3 (12.0)	18 (10.0)	9 (6.3)	0.47**	33 (8.8)
	I feel partially sufficient	11 (42.3)	16 (64.0)	101 (56.1)	83 (58.5)		211 (56.6)
	No, I am not sufficient	10 (38.5)	5 (20.0)	51 (28.3)	44 (31.0)		110 (29.5)
	No answer	2 (7.7)	1 (4.0)	10 (5.6)	6 (4.2)		19 (5.1)
5. If training on the subject is held, would like you to attend?	Yes, I would like to attend	23 (88.5)	22 (88.0)	162 (90.0)	126 (88.7)	0.81**	333 (89.3)
	No, I don't want to attend	1 (3.8)	2 (8.0)	9 (5.0)	10 (7.0)		22 (5.9)
	No answer	2 (7.7)	1 (4.0)	9 (5.0)	6 (4.2)		18 (4.8)

*Kruskal Wallis test used. The mean values of the groups were compared. **Chi-square test used. EMT: Emergency Medicine Technician; PM: Paramedic.

The formula most frequently used by participants to calculate fluid resuscitation was the Parkland formula (32.4%; 121/373), only seven (1.9%) stated that they use the Shriners-Galveston formula. In answer to the question about what fluid they give patients at the scene and during transfer, only 56 (15.0%) marked the correct answer of Ringer's lactate solution. The majority of participants (42.9%; 160/373) answered that they gave one-third normal saline with dextrose solution (0.3% NaCl with 5% dextrose). There was no difference between the groups in terms of the answers given to both questions (p=0.50 and p=0.07, respectively) (Table 2, Questions 3 and 4).

When asked what should be done first by ambulance staffers in major burns cases is, only 47.5% of participants gave the correct answer: assessment of airway maintenance. There was no difference between the groups in terms of the answers given (p=0.36) (Table 2, Question 5).

To relieve pain during the transfer of a burned and confused child, 164 (44.0%) participants stated that they give nothing. Only 86 (23.1%) stated that they give an intravenous analgesic which was the correct answer. There was no difference between the groups (p=0.77). While 89.01% (332/373) of the participants stated that they use topical lidocaine pomade in addition to other topical antimicrobial drugs or alone, only 3.49% (13/373) stated that they do not use pomades that contain lidocaine. There was no difference between the groups (p=0.13) (Table 2, Questions 6 and 7).

In answer to the question, "In which of the following burns is cardiac monitoring more critical?" 203 (54.4%) participants marked electrical burns as the correct answer. There was no difference between the groups (Table 2, Question 8).

In answer to the question about triaging, 249 participants (66.8%) chose to first transfer the patient who had almost no chance of survival due to 95% of the body being burned. Only 86 (23.1%) participants prioritized patients who had a greater chance of survival due to 60% of the body being burned. There was no difference between the groups in terms of the answers given (p=0.32) (Table 2, Question 9).

In answer to the first scenario question that described inhalation injury, only 138 respondents (37.0%) noted that they intubate the patient

Table 2. The answers given by the participants to nine questions and comparison of the results by profession groups

Questions	Choices	Doctor (n=26) (%)	Nurse (n=25) (%)	EMT (n=180) (%)	PM (n=142) (%)	p	All (%)
1. Do you calculate the TBSA** of a burned children at the scene and during transfer?	A. Always	8 (30.8)	8 (32.0)	56 (31.1)	46 (32.4)	0.98*	118 (31.6)
	B. Often	8 (30.8)	10 (40.0)	60 (33.3)	51 (35.9)		129 (34.6)
	C. Sometimes	5 (19.2)	2 (8.0)	33 (18.3)	25 (17.6)		65 (17.4)
	D. Rarely	4 (15.4)	3 (12.0)	19 (10.6)	7 (4.9)		33 (8.8)
	E. Never	0	2 (8.0)	3 (1.7)	9 (6.3)		14 (3.8)
	No answer	1 (3.8)	0	9 (5.0)	4 (2.8)		14 (3.8)
2. By which method do you calculate TBSA in burned children?	Rules of Nines	17 (65.4)	19 (76.0)	136 (75.6)	99 (69.7)	0.69*	271 (72.7
	Patients hand	0	2 (8.0)	7 (3.9)	12 (8.5)		21 (5.6)
	Parkland's Rules of Nines adapted to children***	6 (23.1)	3 (12.0)	21 (11.7)	12 (8.5)		42 (11.3)
	Lund-Browder Scheme	0	0	2 (1.1)	3 (2.1)		5 (1.3)
	Galveston Formula***	0	0	0	2 (1.4)		2 (0.5)
	No answer	3 (11.5)	1 (4.0)	14 (7.8)	14 (9.9)		32 (8.6)
3. By which formula do you to calculate the total amount of fluid to be given to the patient during the transfer?	Parkland	7 (26.9)	6 (24.0)	57 (31.7)	51 (35.9)	0.50*	121 (32.4)
	Shriner's Galveston	1 (3.8)	1 (4.0)	2 (1.1)	3 (2.1)		7 (1.9)
	Evans	1 (3.8)	2 (8.0)	13 (7.2)	9 (6.3)		25 (67
	Brooke	0	4 (16.0)	5 (2.8)	5 (3.5)		14 (3.8)
	Others	4 (15.4)	2 (8.0)	14 (7.8)	18 (12.7)		38 (10.2)
	No answer	13 (50.0)	10 (40.0)	89 (49.4)	56 (39.4)		168 (45.0)
4. Prefferred fluid in the first 24 hours during transfer	10% dextrose solution	0	0	3 (1.7)	3 (2.1)	0.07*	6 (1.6)
	0.9% isotonic NaCl	6 (23.1)	13 (52.0)	47 (26.1)	49 (34.5)		115 ((30.8)
	0.3% NaCl with 5% dextrose	10 (38.5)	6 (24.0)	82 (45.6)	62 (43.7)		160 (42.9)
	Lactated Ringer's	7 (26.9)	3 (12.0)	25 (13.9)	21 (14.8)		56 (15.0)
	0.45% NaCl with 5% dextrose	2 (7.7)	2 (8.0)	8 (4.4)	2 (1.4)		14 (3.8)
	No answer	1 (3.8)	1 (4.0)	15 (8.3)	5 (3.5)		22 (5.9)
5. What is the first intervention that the ambulance team should do at the scene of a 3-year-old girl patient who is burned as a result of pouring hot water at home and has second-degree burn areas to 40% of her body?"	Opening an intravenous line and giving fluid	7 (26.9)	13 (52.0)	62 (34.4)	43 (30.3)	0.36*	125 (33.5)
	Giving analgesic	1 (3.8)	0	1 (0.6)	2 (1.4)		4 (1.1)
	Assessment of airway maintenance	15 (57.7)	8 (32.0)	82 (45.6)	72 (50.7)		177 (47.5)
	Cleansing and dressing burn areas	2 (7.7)	2 (8.0)	12 (6.7)	9 (6.3)		25 (6.7)
	Keeping it under cold water	0	1 (4.0)	17 (9.4)	11 (7.7)		29 (7.8)
	No answer	1 (3.8)	1 (4.0)	6 (3.3)	5 (3.5)		13 (3.5)
6. Which of the following would you do to relieve pain during transfer to confused burned child	I give oral analgesic	0	0	4 (2.2)	3 (2.1)	0.77*	7 (1.9)
	I give intramuscular analgesic	2 (7.7)	2 (8.0)	5 (2.8)	4 (2.8)		13 (3.5)
	I give intravenous analgesic	4 (15.4)	6 (24.0)	41 (22.8)	35 (24.6)		86 (23.1)
	I apply topical lidocaine pomade to the burned areas	5 (19.2)	5 (20.0)	41 (22.8)	32 (22.5)		83 (22.3)
	I give nothing	14 (53.8)	11 (44.0)	81 (45.0)	58 (40.8)		164 (44.0)
	No answer	1 (3.8)	1 (4.0)	8 (4.4)	10 (7.0)		20 (5.4)

Table 2. The answers given by the participants to nine questions and comparison of the results by profession groups *(Continue)*

Questions	Choices	Doctor (n=26) (%)	Nurse (n=25) (%)	EMT (n=180) (%)	PM (n=142) (%)	p	All (%)
7. Which of the following do you use for the first dressing of major children burns at the scene?"	Correct choices****	1 (3.8)	7 (28.0)	39 (21.7)	34 (23.9)	0.13*	81 (21.7)
	Incorrect choices*****	22 (84.7)	17 (68.0)	131 (72.7)	94 (66.2)		264 (70.8)
	No answer	3 (11.5)	1 (4.0)	10 (5.6)	14 (9.9)		28 (7.5)
8. In which type of burn cardiac monitoring is more critical?	Scald burns	0	1 (4.0)	1 (0.6)	1 (0.7)	0.66*	3 (0.8)
	Flame burns	0	0	3 (1.7)	2 (1.4)		5 (1.3)
	Electrical injuries	17 (65.4)	13 (52.0)	93 (51.7)	80 (56.3)		203 (54.4)
	Chemical burns	0	2 (8.0)	8 (4.4)	5 (3.5)		15 (4.0)
	All	6 (23.1)	7 (28.0)	61 (33.9)	43 (30.3)		117 (31.4)
	No answer	3 (11.5)	2 (8.0)	14 (7.8)	11 (7.7)		30 (8.0)
9. There are four children aged 7–10 years at the scene where you are called with a single ambulance. Which of the victims would you choise to take first?	Correct choice	7 (26.9)	10 (40.0)	42 (23.3)	27 (19.0)	0.32*	86 (23.1)
	Incorrect choice	17 (65.4)	14 (56.0)	12 (6.7)	107 (75.4)		264 (70.7)
	No answer	2 (7.7)	1 (4.0)	126 (70.0)	8 (5.6)		23 (6.2)

*Chi-Square test used. The percentages of the groups were compared. **Total Burned Body Surface Area. ***These formulas do not actually exist. They were given as deceptive choices to complete the options. ****The use of topical agents without lidocaine was considered the correct choices. *****The use of Lidocaine alone or in combination with other topical agents was considered as an incorrect option. EMT: Emergency Medicine Technician; PM: Paramedic.

immediately, which is the correct answer. In the second scenario describing four brothers injured in a house fire, only 153 (41.0%) correctly identified the patient who was most likely to undergo emergency intubation due to inhalation injury. Concerning the third scenario, in which knowledge of first intervention and transfer of child major-burn cases was evaluated, only one participant (0.3%) marked both A and B, the correct choices. There was no difference between the groups for the questions in scenarios 1, 2, and 3 (p values were 0.72, 0.20, and 0.33, respectively). The results of the scenario questions are detailed in Table 3.

Only 33 (8.8%) of the participants considered themselves competent in the first intervention and transfer of burned children; 333 (89.3%) stated that they would like to participate in training on pediatric burns, if available. There was no difference in terms of the answers given between the groups for both questions (p values 0.47 and 0.81, respectively) (Table 1).

DISCUSSION

Initial Assessment and Accurate Intervention in Pediatric Burns

The ambulance team should transfer the burned patient to the nearest hospital quickly but in the most accurate way. A quick, primary survey of burned children should be performed at the scene as an initial assessment, followed by a detailed secondary survey, as with other traumas. If an event threatens a patient's life, the aim should be to intervene at the scene by providing airway maintenance, opening vascular access, starting appropriate fluid resuscitation, monitoring the urine catheter if necessary, and transferring the patient to the nearest hospital after proper wound dressing and stabilization. Therefore, the team that performs the first intervention should perform a primary survey quickly by applying the mnemonic A, B, C, D, E, respectively.[3] In a primary survey, the aim is to recognize and eliminate life-threatening injuries. Ambulance staffers should assess the airway immediately.[4] However, in our study, only 47.5% of participants correctly answered that the first thing to do with a patient with major burns is to assess the airway.

Calculating the TBSA

Ambulance staffers should know how to calculate the TBSA because it is necessary for adjusting the amount of fluid given, the classification of the burn (as minor, moderate, or major), and where to transfer the patient (to a hospital, burn unit, or burn center). TBSA can be calculated by three methods: the rule of nines, the patient's hand size, and the Lund-Browder scheme. Although the rule of nines is a suitable method for adults, it provides incorrect measurements for children because the proportions of their body change with age. The patient's hand size can be used to estimate the size of scattered

Table 3. Statistical analysis of answers of participants to scenario questions

Questions	Choices	Doctor (n=26) (%)	Nurse (n=25) (%)	EMT (n=180) (%)	PM (n=142) (%)	p	All (n=373) (%)
1. An 8-year-old boy rescued from a house fire had a total of 20% flame burn on different parts of his body and traces of smoke on his face. After the first intervention, he was taken to the ambulance to be transferred to the nearest hospital. While there were approximately two hours of distance to the hospital, nasal flaring and stridor developed in the patient. Which of the following should be done immediately?**	I give nasal oxygen and observe until to the hospital	3 (11.5)	7 (28.0)	44 (24.4)	30 (21.1)	0.72*	84 (22.5)
	First, I nasal give oxygen, if the patient does not respond I give Salbutamol (Ventolin) inhaler	4 (15.4)	4 (16.0)	20 (11.1)	21 (14.8)		49 (13.1)
	I intubate the patient immediately	10 (38.5)	7 (28.0)	64 (35.6)	57 (40.1)		138 (37.0)
	I give Budesonide (Pulmicort) inhaler if he does not respond to nasal Oxygen and Salbutamol inhaler.	5 (19.2)	6 (24.0)	37 (20.6)	24 (16.9)		72 (19.3)
	I only observe	1 (3.8)	0	0	1 (0.7)		2 (0.5)
	No answer	3 (11.5)	1 (4.0)	15 (8.3)	9 (6.3)		28 (7.5)
2. Flame burns occurred in four brothers as a result of a hoouse fire. Which of the patients whose burns are described below is more likely to be indicated for emergency intubation?	Correct answer***	11 (42.3)	9 (36.0)	66 (36.7)	67 (47.2)	0.20*	153 (41.0)
	Incorrect choices	13 (50.0)	12 (48.0)	100 (55.0)	68 (47.9)		191 (51.2)
	No answer	3 (11.5)	4 (16.0)	16 (8.3)	7 (4.9)		29 (7.8)
3. Which should not be done at the scene and during the transfer to the patient who has a 50% TBSA as a result of falling into the milk cauldron?	Correct answer	0	0	0	1 (0.7)	0.33*	1 (0.3)
	Incorrect choices	24 (92.3)	20 (80.0)	161 (89.4)	127 (89.4)		332 (89.0)
	No answer	2 (7.7)	5 (20.0)	19 (10.6)	14 (9.9)		40 (10.7)

*Chi-square test used. **As inhalation injury is developing in the patient, it should be intubated immediately. EMT: Emergency Medicine Technician; PM: Paramedic.

burns.[5] The Lund-Browder scheme more precisely estimates children's TBSA.[4] Only 31.6% of participants reported that they always calculate TBSA. While 72.7% stated that they use the rule of nines, only five participants (1.3%) use the Lund-Browder scheme. These results show that the participants lack information on the subject.

Fluid Resuscitation

Delayed fluid resuscitation in major pediatric burns leads to hypovolemic shock and secondary acute renal failure, prolonged hospital stay, increased complications, and mortality.[6–8] The first-choice fluid for resuscitation in the first 24 h of both pediatric and adult burns is Ringer's lactate solution, as its structure and osmolality are close to the physiological fluids of the body.[9,10] However, Ringer's lactate solution with a 5% dextrose solution can be given to infants and children <5 years to prevent hypoglycemia.[6]

Numerous formulas have been devised for calculating the amount of fluid to be given to burned patients in the first

24 h. Two formulas are recommended for children: Parkland formula, and Galveston formula developed by Shriners Hospital for Children in Cincinnati.[8] The general approach to fluid resuscitation is to start with one of these formulas and intervene dynamically according to the patient's urine output and hemodynamic stability.[11] The formula most frequently used by participants for fluid calculation was the Parkland formula (32.4%). Only 1.9% of participants reported that they use the Galveston formula, which is more suitable for children. The fact that only 15% of respondents give Ringer's lactate solution to patients in the first 24 h shows they are not sufficiently knowledgeable about the calculation of fluid in burned children and appropriate fluid therapy.

Recognition and Management of Inhalation Injury

An inhalation injury can occur as a result of thermal damage caused by a high temperature in the supraglottic zone, irritation caused by chemicals in the airways, systemic toxicity due to agents such as carbon monoxide and cyanide, or a combination of these.[12] An inhalation injury is one of the most critical risk factors that increase mortality and morbidity with burns and increases mortality by 24 times in flame burns.[13] In general, a diagnosis is made with history and clinical findings. Exposure to flames, smoke, or chemical gas in an enclosed area in the patient's history should suggest an inhalation injury. In a physical examination, burns to the face, beard, and nose hairs; soot on the face and in nostrils; soot in the sputum; and signs of obstruction in the airways (stridor, et cetera) should be considered an inhalation injury.[14] If the patient has respiratory distress symptoms such as hoarseness, stridor, nasal flaring, retractions in the intercostal muscles, inability to swallow saliva, drooling, or fluctuating consciousness, the patient should be intubated immediately to protect the airways. Because children's airways are smaller in diameter than an adult's, even a small amount of edema can close them and cause respiratory failure. Therefore, immediate recognition of inhalation injury and early intubation before edema blocks the airway can be life saving.[15] Airway management should be considered in younger children (<2 years) with more extensive (>20% TBSA) scald injuries, as well as in children with flame or inhalational injury.[15]

In the scenario questions, fewer than half of the participants made the correct diagnosis of inhalation injury and knew that they had to intubate the patient immediately (Table 3). From these results, it was determined that more than half of the participants lacked knowledge of inhalation injury and how to identify patients with a high mortality risk if not recognized and intubated in time.

Analgesia in Burn Patients

Burns are a very painful trauma, so one of the first tasks of an ambulance staffer should be to relieve the patient's pain. However, studies show that pain relief in burn patients is generally neglected worldwide.[16] During pre-hospital intervention and transfer, only 13–20% of burned children were reported to have received analgesic therapy.[15] Children in a stable condition and with a TBSA <15% may be given oral analgesics such as paracetamol or ibuprofen. However, it is better to give intravenous analgesics to children who are confused, or who have a larger TBSA. Only 23.1% of participants answered the question about pain management during patient transfer correctly; 44% stated they use topical lidocaine pomade to relieve pain. These results show that ambulance personnel lack knowledge about the necessary analgesic treatment in the pre-hospital setting. The use of topical lidocaine is contraindicated, especially in major burns and confused patients. It will be discussed in detail below.

Cardiac Monitoring

Electrical injuries are less common (4%) than burns caused in other ways, but their mortality rates are higher. According to the American Burn Association guidelines, regardless of the size of the TBSA, all electrical injuries are considered major burns. Cardiac problems are the most common cause of death in patients with both low-voltage (<1000 V) and high-voltage (>1000 V) electrical injuries.[17] The most common ECG changes are nonspecific ST changes, and the most common dysrhythmia is atrial fibrillation, but the most common cause of death is ventricular fibrillation.[18] Therefore, cardiac monitoring is crucial.[19] About half of the participants (54.4%) correctly answered that cardiac monitoring is more important in electrical injury cases.

Approach to Major Burns in Pediatric Patients

Fast and accurate intervention can be life-saving in pediatric major-burn patients. Incorrect interventions can increase mortality and morbidity. According to the answers given to the question about approaches to victims with major burns, there is a significant lack of knowledge among participants, both during the first intervention and in the transfer.

Topical Antimicrobial and Lidocaine Use in Wound Care

Various topical antimicrobial agents can be used during the first intervention and transfer for wound dressing in burns. In Turkey, health professionals commonly use topical 5% lidocaine hydrochloride (Anestol pomade®, Sandoz, Istanbul, Turkey) for its analgesic effect, either alone or with topical antimicrobial agents. One tube of lidocaine hydrochloride pomade is 30 g and contains a total of 1.5 g lidocaine hydrochloride. Lidocaine is known to cause serious systemic side effects in both local and parenteral use, as well as serious systemic side effects in topical use, especially in children. These side effects include mild skin reactions (rashes, purpura, erythema), methemoglobinemia, central nervous system toxicity (status epilepticus, convulsions, respiratory depression, coma, et cetera), and cardiotoxic side effects (hypertension, tachycardia, arrhythmias, heart failure, and cardiac arrest).[20–28] The maximum toxic dose limit of lidocaine is 4.5 mg/kg,

and it should not be used more than 2 or 3 times a day.[22] For major burns, more than this amount is generally used at once. Since burn patients typically have increased skin absorption as a result of impaired skin integrity, the risk of side effects increases. Therefore, topical lidocaine applications for analgesia are contraindicated, especially in children with a large TBSA. However, as discussed above (section 4.5), 22.3% of participants stated that they use topical lidocaine hydrochloride as an analgesic, even with confused patients. Instead, we recommend giving oral or intravenous analgesics, depending on the patient's condition.

The aim of the question on topical agents used in pediatric burns was to evaluate whether the participants actually use topical lidocaine. While only 21.7 % stated that they use drug combinations without lidocaine hydrochloride, 70.8% stated that they use lidocaine hydrochloride either alone or in combination (Table 2).

Triaging at the Scene

In cases with numerous victims, the ambulance team that reaches the scene first must triage patients in order of priority, and select one to transfer. The majority of participants answered that they should first transfer patients with a low chance of survival. A patient with 60% TBSA has a better chance of recovery if they receive an accurate intervention than a patient with a 95% TBSA, who is unlikely to recover, despite treatment. Therefore, the correct choice would be to transfer patients with a lower TBSA first.

Training of Ambulance Staffers

Because ambulance staffers make the first intervention with burn patients, they must be well trained. However, only 27.9% of respondents stated that they had undergone training after joining the profession, and only 18.2% stated that they received training on pediatric burns (Table 1). This training only consisted of sections of the ALS and PALS courses, and when the content of these courses is reviewed in detail, it is evident that burns are not well covered. Therefore, it is evident that ambulance staffers have received very little burns training. Consequently, only 8.8% of participants stated that they felt competent making first interventions and transfers for pediatric burns (Table 1), and 333 (89.3%) participants stated that they wanted more burns training. All ambulance staffers should be provided with relevant training, which should be repeated at regular intervals so it is not forgotten.

Conclusion

Ambulance staffers' rapid and accurate first intervention and hospital transfer in pediatric burns cases significantly affect mortality and morbidity. Fast and effective intervention at the scene and in the ambulance can reduce mortality and morbidity, whereas inappropriate transfers may increase them, and harm rather than benefit the patient. Ambulance staffers must engage in airway management; correctly calculate TBSA and evaluate it in terms of adequate fluid resuscitation with the accurate fluid, concurrent trauma, or toxicity; stabilize the patient and transfer them to the hospital appropriately.[15] However, the results of our survey show that ambulance staffers do not have sufficient knowledge of pediatric burns, and have not received sufficient training. For this reason, we suggest that all ambulance personnel should be provided with burn training, and this training should be organized in courses and repeated periodically, to keep knowledge up-to-date.

Ethics Committee Approval: This study was approved by the Ankara Children's Health and Diseases Hematology Oncology Training and Research Hospital Clinical Research Ethics Committee (Date: 20.05.2019, Decision No: 219/143).

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: S.D., C.İ.Ö., M.N.A., E.Ş.; Design: S.D., C.İ.Ö., M.N.A., E.Ş.; Supervision: S.D., C.İ.Ö., M.N.A., E.Ş.; Resource: S.D., A.E., S.A.B.; Materials: S.D., A.E., S.A.B.; Data: S.D., A.E., S.A.B.; Analysis: S.D., D.G., A.E., S.A.B.; Literature search: S.D., D.G., A.E., S.A.B.; Writing: S.D., D.G., A.E., C.İ.Ö., M.N.A., E.Ş.; Critical revision: S.D., C.İ.Ö., M.N.A., E.Ş.

Conflict of Interest: None declared.

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

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ORİJİNAL ÇALIŞMA - *ÖZ*

112 Ambulans servisi çalışanlarının çocuk yanıklarına yaklaşımları: Bir anket değerlendirmesi

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AMAÇ: Bu çalışmayı yapmaktaki amacımız, 112 ambulans servislerinde çalışan ve ilk müdaheleyi yapıp olay yerinden hastanelere transferlerini sağlayan sağlık personelinin (doktor, hemşire, paramedik ve acil tıp teknikerleri) çocuk yanıkları olgularına ilk müdahale ve transfer ile ilgili bilgilerini değerlendirmektir.
GEREÇ VE YÖNTEM: Çalışmaya Ankara ilindeki 112 ambulans servislerinde çalışan 373 sağlık çalışanı dahil edildi. Katılımcılara çocuk yanıklarına yaklaşım hakkında 17 soru soru soruldu. Çalışmanın verileri Statistical Package for Social Sciences (SPSS) 21.0 programı ile analiz edildi.
BULGULAR: Katılımcıların (n=373) 26'sı (%7) doktor, 25'i (%6.7) hemşire, 180'i (%48.3) acil tıp teknikeri ve 142'si (%35.3) paramedik idi. Katılımcılardan 118'i çocuk yanık olgularında yanık yüzey alanlarını her zaman hesapladıklarını belirtirken, yanık yüzey alanlarını hangi yöntemle hesapadıkları sorusuna ise sadece beş kişi (%1.3) çocuklar için doğru seçenek olan Lund-Browder şeması seçeneğini işaretledi. Katılımcılardan 121'i (%32.4) transfer esnasında verilecek sıvı miktarını hesaplamada Parkland formülünü kullandıklarını belirtirken sadece yedi kişi (%1.9) çocuklar için daha uygun seçenek olan Galveston formülünü kullandıklarını belirtti. Olay yerinde ve transfer esnasında hangi sıvıyı veriyorsunuz sorusunu 56 kişi (%15) doğru seçenek olan laktatlı ringer solüsyonu olarak yanıtladı. İnhalasyon hasarını tanımak için sorulan senaryo sorusuna 153 katılımcı (%41) doğru cevap verirken, inhalasyon hasarı kliniği anlatılan soruyu sadece 138 kişi (%37) doğru seçenek olan "hemen entübe ederim" şeklinde cevapladı. Üç yüz yetmiş üç katılımcıdan sadece biri (%0.3) %50 sıcak sıvı yanığı olan hastaya ilk müdahale ve transfer sırasında yapılacakları doğru şekilde işaretledi. Katılımcıların topikal lidokain kullanımı oranı yüksek olarak (%70.8) bulundu. Katılımcılardan sadece 33'ü (%8.8) kendilerini çocuk yanık olgularına ilk müdahale ve transfer konularında yeterli hissederken, 333'ü (%89.3) konuyla ilgili bir eğitim düzenlenirse katılmak istediklerini belirttiler.
TARTIŞMA: Çocuk yanık hastalarını olay yerinde ilk gören ve ilk müdahaleyi yapan 112 ambulans çalışanlarının konuyla ilgili bilgilerinin yeterli düzeyde olması beklenir. Ancak anket sonuçlarımız bilgilerinin yeterli düzeyde olmadığını göstermektedir. Bunun için 112 çalışanlarına konuyla ilgili eğitimlerin verilmesi ve bu eğitimlerin periyodik aralıklarla tekrarlanması gereklidir.
Anahtar sözcükler: Acil tıp teknisyeni; ambulans; çocuk; doktor, hemşire; paramedik; transfer; yanık.

Ulus Travma Acil Cerrahi Derg 2022;28(4):447-455 doi: 10.14744/tjtes.2020.91045