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Assessment of prehospital medical care for the patients transported to emergency department by ambulance



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ABSTRACT

Objectives: In our study we aimed to investigate the quality and quantity of medical management inside ambulances for 14 and over 14 years old patients transported to a level three emergency department (ED).

Material and methods: Our study was conducted prospectively at a level three ED. 14 and over 14 years old patients who were transported to the ED by ambulance were included in the study consecutively. "Lack of vital rate" was described as missing of one or more of five vital rates during ambulance transportation. Both of two attending emergency physicians evaluated the medical procedures and management of patients at the ambulance simultaneously and this was recorded on the study forms.

Results: Four hundred and fifty six patients were included in the study. Missing vital signs were identified for 90.1% (n = 322) of the patients that were transported by physicians and 92.4% (n = 73) of the patients that were transported by paramedics. For five patients with cardiac arrest two (33.3%) had cardiopulmonary resuscitation (CPR), one (20%) was intubated, one (20%) received adrenaline. Out of 120 patients, needed spinal immobilization, 69 (57.5%) had spinal board. Cervical collar usage was 65.1% (n = 69) We have revealed that 316 (69.3%) patients did not receive at least one of the necessary medical intervention or treatment.

Conclusion: During ambulance transportation, life-saving procedures like cardiopulmonary resuscitation, vital sign measurement, crucial treatment administration, endotracheal intubation, defibrillation, fracture immobilization were not performed adequately. Increasing the training on the deficient interventions and performing administrative inspections may improve quality of patient care.

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1. Introduction

Primary mission for prehospital emergency services are bringing patients from the scene to the hospitals as soon as possible. In addition to that medical approach during transportation for critically ill patients may be lifesaving.¹ In our country with 20 years of history 112 Emergency and Rescue Services have

designated standards and the quality and quantity of minimum medical equipment and materials, the job description of paramedics and emergency medical technicians (EMTs), the medical management flow charts are also have detailed descriptions.^{2,3} There are limited number of studies that are investigating the adequacy of proper medical management and treatment during ambulance transportation in our country.^{4–8}

In our study, we aimed to investigate the quality and quantity of medical management inside ambulances for 14 and over 14 years old patients transported to a level three emergency department (ED).

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2. Material and methods

Our study was conducted prospectively at a level three ED with around 200.000 annual patients. Prior ethical committee approval was obtained. 14 and over 14 years old patients who were transported to the ED by ambulance, from November 15th to December 15th 2011 were included in the study consecutively. Informed consent was obtained from all of the patients or their relatives. Patients who did not accept to participate or patients without adequate data were excluded from the study. During the study period, overall patient count of all ED patients and patients who were transported by ambulance was obtained from hospital information system.

Patients' demographic variables, initial diagnosis for patients who were transported from the scene, trauma mechanisms, case arrival times and ED arrival times, type of ambulance and medical personnel, prehospital medical approaches and treatments were obtained by the ED resident physicians and recorded at the study form. "Lack of vital rate" was described as missing of one or more of five vital rates (systolic and diastolic blood pressure, respiratory rate, pulse rate, oxygen saturation level and temperature) that should have been evaluated during ambulance transportation. Both of two attending emergency physicians evaluated the medical procedures and management of patients at the ambulance simultaneously and this was recorded on the study forms.

Statistical analyses were performed using "Statistical Package for Social Sciences (SPSS) for Windows version 17.0" (SPSS Inc., IL, USA) program. Quantitative variables were analyzed with one way variance analysis (Anova). Quantitative variables were defined as count and percentage (%), qualitative variables were defined as average \pm standard deviation (SD) or mean (minimum–maximum).

3. Results

During study period, among 30.808 overall ED patients, 2.8% ($n = 873$) were brought in the ED by ambulance. Four hundred and seventeen patients were excluded due to insufficient data or missed recordings as a result of overcrowding at the ED. Four hundred and fifty six patients were included in the study. Two hundred and fifty seven (56.4%) of the patients were male and the average age of all the patients was 53.7 ± 21.8 (range 14–94 years).

We found that 171 (37.5%) of the patients were brought to ED due to trauma and 285 (62.5%) due to non-trauma related reasons. Three hundred and fifty four (77.6%) of the patients were transported from the scene and 102 (22.4%) were transported from other medical facilities. Accompanying medical personnel inside the ambulance were 357 (78%) medical doctors, 79 (17%) paramedics, 13 (3%) EMTs and seven (2%) nurses. 57.7% ($n = 263$) of the patients were discharged from the ED, 29.6% ($n = 135$) were admitted to wards or intensive care units, 7.2% ($n = 33$) were sent to other facilities while 4.4% ($n = 20$) of the patients refused medical attention and left the ED and 1.1% ($n = 5$) have died.

We found that recorded vital signs were missing for 90.1% ($n = 322$) of the patients that were transported by physicians, 92.4% ($n = 73$) of the patients that were transported by paramedics, 76.9% ($n = 10$) of the patients that were transported by EMTs and 100% ($n = 7$) of the patients that were transported by nurses. Most missing vital signs were temperature (88.4%, $n = 403$), oxygen saturation (55.9%, $n = 255$), respiratory rate (48.7%, $n = 222$), pulse rate (21.9%, $n = 100$) and blood pressure (11%, $n = 50$).

Evaluation of two attending emergency physicians revealed that for the patients that needed intravenous (IV) line inside the ambulance 47.6% ($n = 216$) had proper intervention, 27.8% ($n = 126$) had none and 24.7% ($n = 112$) had improper intervention (22 gauge or less IV line or inactive IV line).

Table 1

The medical interventions that needs to be performed by the ambulance personnel and the application rates.

Medical intervention	Necessity of the intervention n	Performed intervention n (%)
Defibrillation	2	–
Endotracheal intubation	6	2 (33.3)
Oxygen administration	161	79 (49.1)
Cardiopulmonary resuscitation	6	2 (33.3)
Airway administration	10	6 (60)
Blood glucose measurement	93	50 (53.8)
Cervical collar administration	106	69 (65.1)
Spinal board administration	120	69 (57.5)
Fracture immobilization	15	4 (26.7)
Bleeding control	18	13 (72.2)
Heating blanket administration	1	–

The medical interventions that needs to be performed by the ambulance personnel and the number of applications and their percentages are shown at Table 1. The medication that needs to be given by the ambulance personnel and the application rates are shown at Table 2.

We have identified that among 456 patients, 316 (69.3%) of them had at least one necessary medical application or treatment that was never performed by the ambulance personnel.

4. Discussion

Prehospital medical services have been established for immediate transfer and treatment of seriously injured and critical patients. In spite of that the recent increased usage of ambulances by the patients with low level injuries and non emergency reasons complicates their capabilities.⁹ In our country, with the development of prehospital services, ambulance protocols for minimum medical equipment and materials and necessary medical interventions have been tried to standardize.^{2,3}

In this study that we aimed to investigate the proficiency of medical management for the patients transported by ambulances, we have revealed that 316 (69.3%) patients did not receive at least one of the necessary medical intervention or treatment. Similarly in 2002 Soysal et al surveyed 58 participants (emergency medicine residents, attending physicians, faculty members) and discovered that 46.6% of the participants defined prehospital emergency interventions as inadequate.¹⁰ The reasons for that may be short

Table 2

The medication that needs to be given by the ambulance personnel and the application rates.

Medication	Necessity n	Performed n (%)
Adrenalin	5	1 (20)
Nitroglycerin	26	6 (23.1)
Salbutamol	15	1 (6.7)
Saline	115	23 (20)
Antihistaminic	1	1 (100)
Antiemetic	10	1 (10)
Active charcoal	5	–
Atropine	3	1 (33.3)
Captopril	28	10 (35.7)
Insulin	12	–
Dextrose	1	1 (100)
Steroid	6	2 (33.3)
Benzodiazepine	1	–
Morphine	6	–
Oxygen	25	7 (28)

transportation period that limits intervention procedures, insufficient training of the ambulance personnel, limited environment of the ambulance for interventions, prior interventions for the patients that were transported from other facilities. Retrospective inspection of the medical interventions and treatments inside ambulances and investigating the reasons of insufficiencies may increase the quality of service for prehospital emergency services.

We have discovered significant amount of insufficiency for vital sign measurement. Temperature measurement (88.4%) was the most lacking vital sign and it can be lifesaving for some patients (hypothermia or hyperthermia etc.). Vital sign measurement should be a priority for the proper evaluation of patients in the ambulance.

Early recognition of sudden cardiac arrest and proper management of the patient can prevent irreversible damages.¹¹ In our study for five patients with cardiac arrest all of them had IV line but only two (33.3%) had cardiopulmonary resuscitation (CPR), one (20%) was intubated, one (20%) received adrenaline. Even though it was indicated defibrillation was not performed for two patients. A study by Yıldız et al revealed that for cardiopulmonary arrest patients 36.4% had CPR and only 20% had IV line and endotracheal intubation.¹² Soysal et al stated that 50% of the patients received CPR which is higher than our study.¹⁰ These findings indicates that in ambulances CPR is not performed efficiently.

In our study we discovered that 2 patients were transported to the ED after endotracheal intubation. One of the patients was brought in after cardiopulmonary arrest but have died despite resuscitation efforts at the ED. The other patient was intubated with the initial diagnosis of acute coronary syndrome. The other 13 patients with Glasgow Come Scale (GCS) 8 and under did not receive any interventions for protecting airway safety. Similarly Soysal et al and Yıldız et al reported in their studies that patients with GCS 8 and under were not intubated.^{10,12} The lack of prehospital lifesaving interventions for “critical” patient group may be improved with theoretical and practical trainings of the healthcare workers and regular administrative inspections.

Oxygen application for patients with respiratory distress is one of the easiest and basic interventions. In our study we revealed that 28% of 25 patients with oxygen saturation below 90%, did not receive oxygen. A 20 question survey study about oxygen treatment, by Serinken et al in 2007, inquired 39 physicians working at 112 ambulances in Denizli. Their results stated that their knowledge was generally insufficient.¹³

Yıldız et al stated that for the trauma patients only 16% were transferred with cervical immobilization and 19.3% after spinal board implication from other facilities. In addition to that for trauma patients transferred by 112 ambulances 48.8% had spinal board and cervical collar.¹² Soysal et al informed that out of 23 patients who needed spinal board and cervical collar; 9 (39.1%) had spinal board, 1 had scoop stretcher; and for the 9 patients with spinal board only 5 (55.6%) had cervical collar.¹⁰ In our study out of 120 patients who needed spinal immobilization 69 (57.5%) had spinal board. Also, we have discovered that cervical collar usage was 65.1% for the trauma patients. Out of 15 p with initial fracture diagnosis only 4 had inflatable splint implemented. 13 (72.2%) patients had bleeding control out of 18 patients with bleeding due to trauma. For one patient brought in to our ED with an initial diagnosis of near drowning we have recorded that oxygen and cervical immobilization was not performed, his wet clothes were not taken off and heating blanket was not used. Morbidity and mortality can be reduced for trauma patients with early interventions based on the mechanism and severity of their trauma. For this reason medical equipment in ambulances have been prepared for stabilization of possible trauma patients.⁵ This will also help to prevent morbidity during transfer of these patients.¹ Our study findings are

similar to previous studies, revealing that prehospital immobilization and management of trauma patients are inadequate.

Beta-2 adrenergic agonists are one of the first line drugs for treatment of bronchospasm. We discovered that they were used only for one of the 15 patients with respiratory distress and documented bronchospasm after initial evaluation at the ED. For patients with active vomiting and nausea only 10% received antiemetic treatment during ambulance transfer. It is important to prevent aspiration and mortality especially for patients with low GCS during transportation and antiemetic treatments are important to reduce possible complications. We discovered that none of the 5 patients received active charcoal treatment that were brought in after toxic drug overdose. However it is known that, for certain patients active charcoal treatment within 1 hour of toxic overdose will improve their conditions.

5. Limitations

Certain limitations should be considered for evaluating our study findings. First limitation is that our study was single-center study. Because of that generalizability of our results is significantly limited. Second limitation is that it was performed for patients 14 years and over. For this reason our results cannot be generalized to pediatric patients. The information about the procedures and treatment during transportation was documented by the ED resident that were taking care of the patient. For this reason some of the data may not be accurate. Also, patients transported with ambulance are critical relatively, enough data could not be recorded for all the patients while they were having medical attention at the same time. So, our missed subject ratio is high.

The proficiency of prehospital procedures and treatments were evaluated by two attending emergency physicians. These physicians were not present during transportation and real time evaluation was not possible and it may be subjective. On the other hand, these physicians did not have any experience about out of hospital medical care.

The reason for the lack of procedures and treatment during transportation may be due to the accompanying factors about the characteristics of the ambulances and patients. Some patients may be brought in the ED before the required time for the necessary procedures. For these reasons in order to get objective results about the evaluation of the proficiency of prehospital management, a study that is performed within the ambulance may be more proper.

6. Results

In this study we discovered that life-saving procedures like cardiopulmonary resuscitation, vital sign measurement, crucial treatment administration, endotracheal intubation, defibrillation, fracture immobilization were not performed adequately. Increasing the training on the deficient interventions and performing administrative inspections may improve quality of patient care.

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