

Risk factors related to unnecessary emergency medical services transport for pediatric patients

Journal of International Medical Research

2019, Vol. 47(1) 335–344

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DOI: 10.1177/0300060518801453

journals.sagepub.com/home/imr



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Abstract

Objectives: This study evaluated unnecessary emergency medical services (EMS) transport for pediatric patients depending on whether they received emergency department (ED) treatment after EMS transport.

Methods: Pediatric patients were divided into two groups according to whether they received treatment at the ED (ED treatment) or did not receive treatment at the ED (non-ED treatment).

Results: The non-ED treatment group comprised 65 of the total 794 patients. The elapsed time from scene to arrival at the ED was longer in the non-ED treatment group than in the ED treatment group. Weekdays as the days of EMS transport, ground falls rather than traffic accidents as the reason for non-disease-related symptoms, and no immobilization for prehospital treatment were risk factors for non-ED treatment in EMS-transported patients. Causes of not receiving ED treatment for the non-ED treatment group were the patient's or caregiver's decision (12%) and the doctor's suggestion (88%).

Conclusions: Weekdays rather than weekends, ground falls rather than traffic accidents, and no immobilization before hospital are risk factors for not receiving ED treatment. The most common cause of not receiving ED treatment is the doctor's suggestion.

Keywords

Emergency medical services, pediatrics, emergency department, prehospital, transport, treatment

Date received: 12 June 2018; accepted: 27 August 2018

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Introduction

Emergency medical services (EMS) transport, including prehospital medical treatment and transfer to an appropriate



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medical facility, is important for a good outcome in a medical emergency. Unnecessary EMS transport can result in depreciation of medical care for pediatric patients, including overcrowding of the Emergency Department (ED) and restriction or delay of public ambulance use. Local unpublished data showed that of a total of approximately 10,000 EMS calls during 3 months in the city in which the study hospital was located with a population of 1.2 million, transported calls accounted for 68% and non-transported calls accounted for 32%. Pediatric EMS transportation accounted for 11% of total EMS transportation. Another study showed that non-transported EMS calls accounted for 25% of all EMS calls.¹ Even if the patient is transported by EMS use, EMS transport might be unnecessary. Local unpublished data also showed that the rate of non-treatment at the study hospital ED during the study period was 8.0% (4564/56985) for the total patients and 9.2% (1618/15929) for pediatric patients.

Several studies have reported unnecessary EMS transport based on results of ED treatment after EMS transport.^{2,3} Recent studies have focused on unnecessary EMS transport for adult patients depending on whether they received ED treatment.^{4,5} However, studies on unnecessary EMS transport for pediatric patients are insufficient. Therefore, this study aimed to evaluate unnecessary EMS transport for pediatric patients depending on whether they received ED treatment after EMS transport. Factors associated with no ED treatment following EMS transport were also analyzed.

Patients and methods

Patient population

This retrospective study was approved by the Institutional Review Board of our

hospital. Informed consent was waived because of the retrospective anonymous analysis. Pediatric patients (≤ 18 years of age) who presented to one training university hospital ED, which was located in the southeast coast area of South Korea, by EMS transport from January 2015 to December 2015 were selected for this study. The ED at the study hospital is composed of a general emergency center, a trauma center, and a pediatric emergency room. General pediatric patients are treated in the pediatric emergency room. Non-severe traumatic cases are treated in the general emergency center, while severe traumatic cases are treated in the trauma center.

Data collection

EMS run sheets, which were submitted to the hospital ED by EMS personnel after EMS transport, were reviewed. All EMS run sheets were readable. Therefore, none of the patients were excluded. The fire department is involved in prehospital public EMS transport in South Korea. Therefore, EMS personnel for EMS transport were fire fighters who were certified for prehospital treatment. Patients were divided into two groups according to whether they received treatment at the ED (ED treatment) or did not receive treatment at the ED (non-ED treatment). Non-ED treatment was defined when patients were not treated at the ED, although they were transported to the ED using EMS transport because their symptoms were not severe. All data included in EMS run sheets were categorized as general demographics, clinical characteristics, and prehospital treatment according to characteristics of variables. General demographics, clinical characteristics, and prehospital treatments were compared between the two groups.

General demographics included age, sex, day of EMS use, time of EMS use, season of EMS use, elapsed time from the EMS

call to the scene and from the scene to ED arrival, and location where EMS were requested. The EMS scene time may reflect whether patients had prehospital treatment. There were four age groups as follows: infants (age: 0–1 years), preschool (age: 2–6 years), primary school (age: 7–12 years), and middle or high school (age: 13–18 years). The day of EMS use was defined as a weekday (Monday to Friday) or holiday (Saturday, Sunday, and national holidays). The season of EMS use included spring (March to May), summer (June to August), autumn (September to November), and winter (December to February). Locations of requests for EMS were categorized as the home, residential area, educational facilities, street and freeway, medical facility, outdoor area, public facility, and others. Clinical characteristics of the patients, including symptoms, medical history, characteristics of symptoms, level of consciousness, pupil light reflexes, and alcohol ingestion, were evaluated. We also investigated the medical history, including acute illness (e.g., febrile convulsion) and chronic or congenital diseases. Symptoms were described on the basis of EMS run sheets. Characteristics of symptoms were classified as disease-related or non-disease-related, such as intoxication or trauma. Frequent causes of non-disease-related symptoms were investigated. The level of consciousness was classified as alert or non-alert mental status, including verbal response, pain response, and unresponsiveness. Airway management, the method and amount of oxygen supply, electrocardiographic monitoring, immobilization, wound care, warming or cooling, automated external defibrillator monitoring, direct medical control, and the number and certificate of EMS personnel were evaluated as prehospital treatment. Airway manipulation was determined as manual manipulation or use of equipment. Immobilization was defined if any

immobilization was performed for the cervical, thoracic, or lumbar spine, and extremities. Direct medical control was defined as actual communication between EMS personnel and a medical director/doctor who could guide the prehospital treatment.

There were two reasons for not receiving ED treatment in the non-ED treatment group, as follows: 1) the doctor's suggestion, including absence of symptoms at ED arrival, treatment at the outpatient department or another hospital, and repeat visits to the ED with the same symptoms, and 2) the patient's or caregiver's decision, including refusal of treatment after EMS transport and request to transfer to another hospital. For the "doctor's suggestion", the ED physician first explained to patients or caregivers after a primary examination and then the physician's suggestion was accepted. For the "patient's or caregiver's decision", patients or caregivers refused ED treatment or wanted to transfer to another hospital before an ED physician's examination. Therefore, the ED physician determined that they did not need immediate care in the study hospital.

Statistical analyses

General and clinical demographics and prehospital treatment were compared between the ED treatment group and the non-ED treatment group using the Student's t-test, chi-square test, and Fisher's exact test. Multivariate logistic regression analysis was performed to determine factors that were associated with non-ED treatment in patients with EMS transport using significant factors ($p < 0.1$) from univariate comparison, including the Student's t-test, chi-square test, and Fisher's exact test between the two groups. Statistical analysis was performed using IBM SPSS Statistics for Windows 21.0 (IBM Corp., Armonk, NY, USA). Significance was set at $p < 0.05$.

Results

During the study period, 794 children visited the study hospital's ED by EMS transport, including 729 (91.8%) children in the ED treatment group and 65 (8.2%) in the non-ED treatment group. During the study period, 794 children visited the study hospital's ED by EMS transport, including 729 in the ED treatment group and 65 in the non-ED treatment group. Children in the preschool age group were the most prevalent. The percentage of EMS use during weekdays was 63% in the ED treatment group and 77% in the non-ED treatment group. The most frequent time of EMS use was 18:00 to 24:00 hours in the ED treatment group and 12:00 to 18:00 hours in the non-ED treatment group. There was no significant difference in EMS response time between the two groups, although the elapsed time from the scene to arrival at the ED was significantly longer in the non-ED treatment group than in the ED treatment group ($p = 0.01$) (Table 1).

In the ED treatment group, seizures were the most common symptom followed by fever. In the non-ED treatment group, laceration was the common symptom followed by fever. Non-disease-related symptoms were significantly more common in the non-ED treatment group than in the ED treatment group ($p = 0.001$). The most common cause of non-disease-related symptoms was traffic accidents in the ED treatment group and ground falls in the non-ED treatment group (Table 2). Use of oxygen manipulation for prehospital treatment was significantly more frequent in the ED treatment group than in the non-ED treatment group ($p = 0.038$). Immobilization was more frequent in the ED treatment group ($p = 0.018$), while wound care was more frequent in the non-ED treatment group ($p = 0.006$) (Table 3). EMS transport on weekdays ($p = 0.006$), ground falls rather than traffic accidents

as the reason for non-disease-related symptoms ($p = 0.003$), and no immobilization for prehospital treatment ($p = 0.02$) were risk factors for non-ED treatment in EMS-transported patients (Table 4).

Causes of not receiving treatment at the ED for children in the non-ED treatment group included the patient's or caregiver's decision (12%) and the doctor's suggestion (88%). The main reason for non-treatment based on the patient's or caregiver's decision was the desire of the patient or caregiver to transfer to another hospital. The most common cause of non-treatment based on a doctor's suggestion was that the suggestion involved outpatient department treatment or transfer to another hospital (Table 5).

Discussion

In this study, unnecessary EMS transport was defined as a lack of treatment at ED following transport to the ED by EMS. Unnecessary EMS transport accounted for 8.2% of all EMS transport. Discovering reasons for unnecessary transport involves scrutiny of the entire EMS process, including the occurrence of symptoms, a request for EMS transport, treatment at the scene and during the transport, and treatment after ED arrival. This scrutiny requires EMS experts. However, analyzing the whole data is difficult. Previous studies only included patients who received ED treatment after EMS transport and investigated the results of ED treatment to evaluate unnecessary EMS transport. The rates of unnecessary EMS transport were reported as 28% and 37% in two studies.^{6,7} However, their findings were limited by a lack of inclusion of patients who did not receive ED treatment after EMS transport. Although the present study also did not include data for all unnecessary EMS transport, findings of the present study are meaningful because we defined patients

Table 1. General demographics of patients with or without ED treatment after EMS use.

	ED treatment (n = 729)	Non-ED treatment (n = 65)	p
Age, years	7.7 ± 6.4	6.4 ± 6.3	0.121
Classification of age			0.287
0–1 (infant)	156 (21.4)	18 (27.7)	
2–6 (preschool)	237 (32.5)	25 (38.5)	
7–12 (primary school)	102 (14.0)	6 (9.2)	
13–18 (middle or high school)	234 (32.1)	16 (24.6)	
Male sex	437 (60.0)	42 (64.6)	0.469
Day of EMS use			0.027
Weekdays	461 (63.2)	50 (76.9)	
Weekends and holidays	268 (36.8)	15 (23.1)	
Time of EMS use, hours*			0.793
00:00 ≤ ~ < 06:00	124 (17.0)	11 (16.9)	
06:00 ≤ ~ < 12:00	141 (19.3)	12 (18.5)	
12:00 ≤ ~ < 18:00	228 (31.3)	24 (36.9)	
18:00 ≤ ~ < 24:00	236 (32.4)	18 (27.7)	
Season of EMS use			0.071
Spring	224 (30.7)	14 (21.5)	
Summer	178 (24.4)	25 (38.5)	
Fall	174 (23.9)	12 (18.5)	
Winter	153 (21.0)	14 (21.5)	
Elapsed time, minutes*	n = 669	n = 64	
From EMS call to scene	6.6 ± 4.7	5.9 ± 2.8	0.283
From scene to arrival at the ED	19.3 ± 11.3	24.2 ± 14.2	0.010
Location of requesting EMS use	n = 713	n = 65	0.043
Home	392 (55.0)	36 (55.4)	
Residential area	25 (3.5)	2 (3.1)	
Educational facility	70 (9.8)	3 (4.6)	
Street, freeway	135 (18.9)	11 (16.9)	
Medical facility	10 (1.4)	2 (3.1)	
Outdoor area	7 (1.0)	2 (3.1)	
Public facility	24 (3.4)	7 (10.8)	
Others	50 (7.0)	2 (3.1)	

Values are mean ± standard deviation or n (%). EMS = emergency medical services; ED = emergency department.

who did not receive treatment at the ED after EMS transport as unnecessary EMS transport. Fire departments are responsible for the 119 (the emergency contact number in South Korea) response and transport to hospitals free of charge. Because EMS personnel in South Korea are emergency medical technician-intermediate, emergency medical technician-basic, or nurses, some medications of advanced life support are not permitted to be used in the prehospital

EMS phase. If EMS personnel receive direct medical control after precise assessment for patients at the scene in South Korea, they can refuse prehospital EMS transportation in the following cases: toothache; a simple common cold without high fever or dyspnea; simple contusion without additional injury; simple alcohol intoxication without any medical problems; a request for transportation for admission or outpatient treatment in patients with

Table 2. Clinical demographics of patients with or without ED treatment after EMS use.

	ED treatment (n = 729)	Non-ED treatment (n = 65)	p
Common symptoms of patients	n = 729	n = 63	
Headache	23 (3.2)	1 (1.6)	
Abdominal pain	34 (4.7)	2 (3.2)	
Other pain	212 (29.1)	20 (31.7)	
Laceration	32 (4.4)	7 (11.1)	
Respiratory difficulty	22 (3.0)	2 (3.2)	
Seizures	118 (16.2)	2 (3.2)	
Nausea/vomiting	41 (5.6)	2 (3.2)	
Epistaxis	9 (1.2)	2 (3.2)	
Fever	95 (13.0)	4 (6.3)	
Foreign body	16 (2.2)	2 (3.2)	
Others	127 (17.4)	21 (32.3)	
Medical history, n of cases/total n (%)	75/729 (10.3)	5/65 (7.7)	0.505
Characteristics of symptoms	n = 726	n = 65	0.001
Disease	380 (52.3)	20 (30.8)	
Non-disease	346 (47.7)	45 (69.2)	
Causes of non-disease	n=346	n=45	0.001
Traffic accident	117 (33.8)	6 (13.3)	
Ground fall	50 (14.5)	17 (37.8)	
Laceration	28 (8.1)	4 (8.9)	
Others	151 (43.6)	18 (40.0)	
Alcohol ingestion, n of cases/total n (%)	15/726 (2.1)	2/65 (3.1)	0.643
Alert, level of consciousness, n of cases/total n (%)	695/714 (97.3)	64/64 (100)	0.392
Normal pupil light reflexes, n of cases/total n (%)	646/654 (98.8)	61/61 (100)	1.000

Values are n (%) unless specified otherwise. ED = emergency department; EMS = emergency medical services.

chronic illness; a request for inter-hospital transportation or transportation from the hospital to home; or disturbance during prehospital EMS activity. Appropriate medical direction of EMS can reduce unnecessary EMS transport. This can be helpful for EMS personnel for making a decision of unnecessary EMS transport.

The law in South Korea requires that all emergency patients must be treated in the ED, regardless of their insurance. However, if an ED physician decides that a patient is a non-emergency, that patient does not need to be treated in the ED. Therefore, the patient can be discharged. Patients with history taking and a physical examination by an ED physician, but without

laboratory or radiological tests or prescriptions, tend not to be charged for ED services in South Korea. All patients in the non-ED treatment group in this study were examined by an ED physician. However, if an ED physician decides that a patient requires immediate treatment, the patient cannot be discharged, even if he or she refuses the ED treatment. In this study, all of the patients with a patient's or caregiver's decision as the reason for non-ED treatment were patients who did not require immediate ED treatment.

In our study, the most common times of EMS transport were 18:00 to 24:00 hours in the ED treatment group and 12:00 to 18:00 hours in the non-ED treatment group.

Table 3. Prehospital treatment of patients with or without ED treatment after EMS use.

	ED treatment (n = 729)	Non-ED treatment (n = 65)	p
Airway manipulation	194 (26.6)	15 (23.1)	0.535
Oxygen supply	99 (13.6)	3 (4.6)	0.038
Oxygen amount administered, L/minute	6.2 ± 4.4 (n = 99)	5.3 ± 4.2 (n = 3)	0.752
Electrocardiographic monitoring	36 (4.9)	2 (3.1)	0.762
Immobilization	78 (10.7)	1 (1.5)	0.018
Wound care	115 (15.8)	19 (29.2)	0.006
Keeping warm or cool	191 (26.2)	13 (20.0)	0.273
AED monitor	25 (3.4)	1 (1.5)	0.715
Direct medical control	46 (6.3)	1 (1.5)	0.167
Number of fire fighters during EMS transport	n = 728	n = 65	0.163
Two	665 (91.3)	56 (86.2)	
Three	63 (8.7)	9 (13.8)	
Certificate of fire fighters	n = 1519	n = 139	
EMT-intermediate	468 (30.8)	52 (37.4)	
EMT-basic	461 (30.3)	49 (35.2)	
Nurse	429 (28.2)	27 (18.7)	
Education with first aid	133 (8.8)	7 (5.0)	
Others	28 (1.8)	4 (2.9)	

Values are mean ± standard deviation or n (%). ED = emergency department; EMS = emergency medical services; AED = automated external defibrillator; EMT = emergency medical technician.

Table 4. Factors associated with non-emergency department treatment in patients with EMS transport.

	Odds ratio	95% CI	p
Weekday EMS use versus weekends and holidays	3.282	1.399–7.698	0.006
Ground fall, causes of non-disease versus traffic accident	7.663	1.980–29.655	0.003
Immobilization	0.084	0.010–0.676	0.020

EMS = emergency medical services; CI = confidence interval.

A previous study reported that the most frequent times children visited the ED were from 12:00 to 18:00 hours (33.3%) and from 18:00 to 24:00 hours (34.4%); another study reported that 47% of children visited the ED from 16:00 to 24:00 hours using EMS transport.^{8,9} The reason for the high frequency of EMS transport from 18:00 to 24:00 hours in the ED treatment group might be because most children

spend their daytime in kindergartens or schools. However, caregiver action is taken in the evening when the ED might be the only option because most primary care clinics or outpatient departments are closed. The reason for the high frequency rate of EMS transport to the ED in the afternoon (12:00 to 18:00 hours) during weekdays in the non-ED treatment group could be because patients are able to seek

Table 5. Causes of non-ED treatment in patients with EMS transport.

	Total: n =65
Patient's or caregiver's decision	8 (12.3)
Denial for treatment after EMS use	2 (3.1)
Desire to transfer to another hospital	6 (9.2)
Based on a doctor's suggestion	57 (87.7)
No symptoms at ED arrival	4 (6.2)
Could be treated in the outpatient department or other hospital	52 (80.0)
Repeated visits with the same symptoms	1 (1.5)

Values are n (%). ED = emergency department; EMS = emergency medical services.

medical care on an outpatient basis or at another hospital besides the ED according to a suggestion by an ED clinician.

The rate of non-disease-related symptoms was 69.2% in the non-ED treatment group, with 37.8% due to ground fall injuries. This finding might reflect the greater activity of children in the afternoon. Over 60% of ED visits by preschool children were due to falls in a previous study.¹⁰ Rapid physical development and an increase in physical activities during preschool age could be explanations for our finding.¹¹ Removal of hazards, parental supervision during play, and safety education for children and caregivers could help lessen unintentional injuries and reduce unnecessary EMS transport.¹²

More immobilization in the ED treatment group and more wound care in the non-ED treatment group were found in our study. The elapsed time from the scene to arrival was longer in the non-ED treatment group than in the ED treatment group. The reason for our findings might be because more wound care than

immobilization was provided to patients in this study. However, because ED physicians can determine whether further ED treatment is necessary more rapidly and easily in cases of wound care than in cases of immobilization in the prehospital phase, prehospital wound care would be more likely in the non-ED treatment group.

This study has several limitations. Our results cannot represent regional or national characteristics of unnecessary EMS transport because it was a retrospective study involving a single training hospital. Moreover, not all potentially pertinent data were included in EMS run sheets. Although the use of EMS might be affected by socio-economic factors, including income and possession of personal cars under non-emergency situations,¹³ we did not investigate these factors. The most frequent cause of not receiving ED treatment was a doctor's suggestion. This finding might be due to a difference in perception for emergency circumstances between patients or caregivers and doctors. However, we did not consider this conceptual difference. Another limitation is that we could not investigate the details of why treatment was denied or refused after EMS use. Reasons for a lack of treatment could have been fear of high-cost ED treatment or recovery of symptoms following prehospital treatment. Additionally, the medical history might have been inaccurate because we only investigated EMS run sheets. Patients in the ED treatment group in this study might have corresponded to the non-ED treatment group according to the time of EMS transport. This is because pediatric patients who are transported to the ED at night tend to receive ED treatment more easily than those during the day, even when their symptoms are not severe. However, we did not consider such a possibility for the ED treatment group. Eleven (11/95, 12%) patients with fever in the ED treatment group had only prescription for medicine without

further treatment at the ED. EMS transport might have been unnecessary for these patients in other studies. However, ED treatment for patients in the ED treatment group was determined to be necessary in this study. We only investigated whether pediatric patients received ED treatment after EMS transport and we only defined those in the non-ED treatment group as having unnecessary EMS transport. Further prospective and multicenter studies based on EMS run sheets and hospital medical records with additional data are required to overcome these limitations.

ED treatment was not received by 8% of pediatric patients following EMS transport in our study. Weekdays rather than weekends, ground falls rather than traffic accidents, and no prehospital immobilization were risk factors for not receiving ED treatment. The most common cause of not receiving ED treatment was a doctor's suggestion to patients or caregivers that they could be treated on an outpatient basis or at other hospitals rather than receiving ED treatment. These clarifications could reduce unnecessary EMS transport, provide high quality EMS care, and decrease social costs. Moreover, inter-facility integration between EMS and the hospital through information sharing is necessary. EMS personnel should provide accurate information of transported patients to the hospital. If hospital data of cases of non-ED treatment after EMS transport are provided to EMS agencies, they might reduce unnecessary EMS transport.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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References

1. Alrazeeni DM, Sheikh SA, Mobrad A, et al. Epidemiology of non-transported emergency medical services calls in Saudi Arabia. *Saudi Med J* 2016; 37: 575–578.
2. Camasso-Richardson K, Wilde JA and Petrack EM. Medically unnecessary pediatric ambulance transports: a medical taxi service? *Acad Emerg Med* 1997; 4: 1137–1141.
3. Weaver MD, Moore CG, Patterson PD, et al. Medical necessity in emergency medical services transports. *Am J Med Qual* 2012; 27: 250–255.
4. Hwang JS, Kim SH and Van Dillen C. Unnecessary emergency medical services transports of geriatric patients in a tertiary hospital in South Korea. *Int J Gerontol* 2018; 12: 222–226.
5. Van Dillen C and Kim SH. Unnecessary emergency medical services transport associated with alcohol intoxication. *J Int Med Res* 2018; 46: 33–43.
6. Kost S and Arruda J. Appropriateness of ambulance transportation to a suburban pediatric emergency department. *Prehosp Emerg Care* 1999; 3: 187–190.
7. Rosenberg N, Knazik S, Cohen S, et al. Use of Emergency Medical Service transport system in medical patients up to 36 months of age. *Pediatr Emerg Care* 1998; 14: 191–193.
8. Acworth J, Babl F, Borland M, et al. Patterns of presentation to the Australian and New Zealand Paediatric Emergency Research Network. *Emerg Med Australas* 2009; 21: 59–66.
9. Shah MN, Cushman JT, Davis CO, et al. The epidemiology of emergency medical services use by children: an analysis of the National Hospital Ambulatory Medical Care Survey. *Prehosp Emerg Care* 2008; 12: 269–276.
10. Younesian S, Mahfoozpour S, Ghaffari Shad E, et al. Unintentional home injury prevention in preschool children; a study of

- contributing factors. *Emergency (Tehran, Iran)* 2016; 4: 72–77.
11. Sethi D, Towner E, Vincenten J, et al. *European report on child injury prevention*. Copenhagen: World Health Organization Europe, 2008.
 12. Ablewhite J, McDaid L, Hawkins A, et al. Approaches used by parents to keep their children safe at home: a qualitative study to explore the perspectives of parents with children aged under five years. *BMC Public Health* 2015; 15: 983.
 13. Kawakami C, Ohshige K, Kubota K, et al. Influence of socioeconomic factors on medically unnecessary ambulance calls. *BMC Health Serv Res* 2007; 7: 120.