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# The Role of Continuous Education in Decreasing Unnecessary Transfers to Emergency Department by Emergency Medical Services; a Before-After Study

**Hossein Dinpanah[1], Elham Azmoude[2], Ali Izadi[3], Mostafa Kamali[4], Reza Ghasemi[5], Farimah Beheshti[6], Samaneh Kakhki[7], Seyed Reza Khatibi[8]**

[1] Emergency Department, 9-Day Hospital, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[2] Department of midwifery, Neyshabur University of Medical Sciences, Neyshabur, Iran.
[3] Health Sciences Research Center, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[4] Department of Health Information Technology, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[5] Department of Cardiology, 9-Day Hospital, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[6] Department of Physiology, School of Paramedical Sciences, Neuroscience Research Center, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[7] Department of Clinical Biochemistry, School of Paramedical Sciences, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[8] Department of Public Health, School of Health, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.

[*] **Corresponding author email:** dinpanahh1@thums.ac.ir
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## Abstract

Emergency medical services (EMS) staff can play an important role in reducing emergency department (ED) overcrowding by decreasing unnecessary transfers. The present study was designed to evaluate the role of continuous education of EMS staff in decreasing the unnecessary transfers to ED. In this before-after study, analysis of 1500 EMS calls according to transferred and not transferred patients to ED was done and an educational package consisting of indications for transferring patients to ED based on existing references was prepared. EMS staff underwent an educational course by mentioned package and data of patients' transportation after training was gathered and compared to the period before training. 3000 calls to pre-hospital emergency service were evaluated (1500 cases before and 1500 cases after training). The number of cases not transferred by EMS increased from 243 (16.2%) cases before training to 461 (30.7%) after that and the decreasing number of transfers to ED after training was significant ($p<0.001$). The highest percentage of decrease in transfer to ED belonged to complaints of lower back pain with 45%, mental problems with 27.7%, and direct extremity trauma with 23.4%, respectively. Patients not transferred to ED on the first call to EMS and coming with daily to ED during one week from the first call with the same complaint decreased from 13.6% (33 cases) to 8% (40 cases) after training. The highest percentage of the delayed coming patient to ED during 1 week after the first call to EMS belonged to cardiac complaints with 4.6% and mental complaints with 2.4%. Based on the findings of the present study, empowering pre-hospital emergency staff by continuous education leads to a 14.5% decrease in unnecessary referral cases and a 5.6% drop in unnecessary visits in ED.

**Key words:** Emergency medical dispatch, Emergency medical services, Triage, Patient safety, Crowding.

## Introduction

Medical emergencies are cases that result in loss of an organ or a life, or mental problems if they are not attended to promptly [1]. To decrease the side effects and mortality due to medical emergencies in various countries, an efficient and successful system called emergency medical services (EMS) has been designed, which has the duty of giving consultations, providing health services on the patient's bedside, and if needed, referring the patient to healthcare centers. In Iran, this service is known as 115 medical emergencies. Since due to the growth in population and shortage of equipment the capacity of this system to respond is limited, there

is a need for taking measures to reach the highest efficiency with the available equipment and prevent mortality and side effects in more patients [2]. We should note that calling the EMS center does not necessarily result in sending an ambulance to the patient's bedside [3, 4]. In many cases, the advice of the emergency technicians and physicians can solve the callers' problem and answer their questions, which prevents the unnecessary visit of the patient to the emergency department (ED) and the consequent unnecessary overcrowding of ED. It should be noted that 115 emergency is not only a vehicle for transferring the patient to the hospital (ambulance). Correct triage of non-emergency cases is one of the important and vital duties of pre-hospital emergency staff. It seems that, continuous education of pre-hospital emergency staff may play an important role in reducing ED overcrowding and providing better care by decreasing visits to ED [2, 5). Therefore, the present study was designed to evaluate the role of continuous education in decreasing the cases of unnecessary transfer to ED by EMS.

## Materials and Methods

### Study design and setting

This before-after study was carried out on EMS staff of Torbat Heydariyeh, Iran, from December of 2015 to March 2017. the patient was categorized based on their initial complaint in the call to ED and transferred and not transferred patients to ED were analyzed, using the educational references of emergency medicine and pre-hospital emergency (books like Rosen, tintinali, AHA, etc.), key points, and red flags for selecting patients in an emergency and need for emergent transfer to ED was highlighted and used for

re-training of paramedic technicians. Finally, the rate of decrease in unnecessary transfer to ED after the mentioned re-training course was assessed.

### Participation

Pre-hospital emergency staff of mentioned city was the participants of the present study without any age or sex limitation. They were excluded from the study if they did not give consent for participation in the study.

### Intervention

Initially, the calls were divided into 10 groups based on the type of their complaint at the time of contacting EMS, namely; multiple trauma, direct trauma, internal medicine, mental health, low back pain, cardiac, pediatric, surgery, gynecology, and others.

Then during 3 months (before training) by considering the history and clinical examination all the patients who could have been treated at home or referred to a non-emergency health care center without transfer to the ED from the viewpoint of emergency medicine specialists were identified.

In addition, data of not transferred patients and transferred patients that have the potential to not transfer to ED and dispatch records during the mentioned period were analyzed.

According to the findings of the first phase and using the official references of teaching emergency medicine and pre-hospital emergency, an educational program was prepared for the 10 mentioned groups. This educational program also considers characteristics such as local and cultural characteristics of the region, age, sex, economical status, place of residence, time of contact, triage level, chief complaint, and history of the patient when deciding to transfer the patient to ED or not. This educational program was prepared by emergency medicine specialists with the help of paramedic technicians and social workers. Then all the staff members of the pre-hospital emergency service who participated were re-trained during six 6-hour sessions in the mentioned programs.

### Data gathering

After the education phase EMT staff according to chief complaint and clinical examination of patients in each of the 10 mentioned groups if thought patient has the potential to not be transferred to ED check the red flags and indications for that group recorded in a checklist and with considering demographic characteristics.in addition, the data of treatment process of the patients and discharge,

presentation to ED again or contacting EMS again during 1 week, and the patient's data that were not transferred to ED on the first call and coming to ED during one week from the call were recorded.

**Statistical analysis**

Data were statistically analyzed using SPSS 21 software. To report the results, mean and standard deviation (SD) or frequency and percentage were used.

## Results and Discussion

Finally, 3000 calls to pre-hospital emergency service were evaluated (1500 cases before and 1500 cases after training). All the EMS staff were in the paramedic level of education (EMT-P). The number of cases that were not transferred to the emergency department increased from 243 (16.2%) cases before training to 461 (30.7%) cases after that and the decreasing number of transfers to ED after training was significant (p value<0.001).

Table 1 depicts the frequency and percentage of the patient that were not transferred to the emergency department by EMS before and after training based on different complaints. The highest percentage of decrease in the transfer of the patient to ED belonged to complaints of lower back pain with 45%, mental problems with 27.7%, and direct extremity trauma with 23.4%, respectively.

**Table 1:** Frequency of patients not transferred to the emergency department in pre-and post-education periods

| Diagnosis | Pre-education | Post-education | Differences* |
|---|---|---|---|
| Multiple trauma | 25 (13.7) | 56 (29.3) | 31 (15.6) |
| Direct trauma | 25 (12.1) | 43 (35.5) | 18 (23.4) |
| Internal medicine | 63 (16.2) | 125 (30.7) | 62 (14.5) |
| Mental health | 14 (40) | 21 (67.7) | 7 (27.7) |
| Low back pain | 24 (30) | 51 (75) | 27 (45.0) |
| Cardiac | 13 (9.1) | 15 (13.5) | 2 (4.4) |
| Pediatric | 16 (16) | 20 (23.2) | 52 (8.1) |
| Surgery | 18 (17) | 27 (30) | 4 (7.2) |
| Gynecology | 8 (30.8) | 14 (50) | 9 (13) |
| Others | 37 (16.1) | 89 (24.2) | 6 (19.2) |

Data were presented as N (%), *Number and percentage of decrease in cases referred to hospital during the study period

In addition, patients who were not transferred to the hospital on their first call to EMS and themselves come to the emergency department during one week with the same complaint they contacted EMS decreased from 13.6% (33 cases) before training to 8% (40 cases) after training. Table 2 shows the cases who were not transferred to the hospital on their first call to EMS and visited in ED during 1 week after contact before and after training. The highest percentage of the patient that no transfer with EMS and coming to the emergency department during 1 week after the first call to EMS belonged to cardiac complaints with 4.6% and mental complaints with 2.4% Regarding other complaints. Percent of a patient with delayed visits had decreased compared to before training.

**Table 2:** Frequency of non-transfer patients with EMS who came with the same complaint to the emergency department during 1 week after their initial contact with EMS

| Diagnosis | Pre-education | Post-education | Differences* |
|---|---|---|---|
| Multiple trauma | 3 (12) | 4 (7.1) | 1 (-4.9) |
| Direct trauma | 4 (16) | 2 (4.6) | -2 (-11.4) |
| Internal medicine | 10 (15.9) | 13 (10.4) | 3 (-5.5) |
| Mental health | 1 (7.1) | 2 (9.5) | 1 (2.4) |
| Orthopedic | 1 (4.2) | 3 (5.9) | 2 (1.7) |
| Cardiac | 2 (15.4) | 3 (20) | 1 (4.6) |
| Pediatric | 3 (18.7) | 2 (10) | -1 (-8.75) |
| Surgery | 3 (16.7) | 3 (11.1) | 0 (-5.6) |
| Gynecology | 2 (25) | 3 (21.4) | 1 (-3.6) |
| Others | 4 (10.8) | 5 (5.6) | 1 (-5.2) |

Data were presented as N (%), *Number and percentage of decrease in cases referred to hospital during the study period

**One-week outcome**

In the period before training, from 33 patients who no transfer with EMS and came to ED during 1 week after the first call to EMS with a similar complaint, only 1 patient (3.03%) with the chief complaint of stomach ache was deemed in need of admission by the emergency medicine physician and the other cases did not need to be hospitalized and were treated as outpatients.

However, after training, from 40 patients who were coming to ED with a delay during one week with the same initial complaint, 3 patients (7.5%) were deemed in need of hospitalization in the end. These 3 cases included 1 case of fever in a 2.5-year old child, 1 case of stomach ache and diarrhea with the final diagnosis of diabetic ketoacidosis, and 1 case of surgical acute abdomen with the final diagnosis of appendicitis. No case of death or disability due to delay in a referral or not being transferred was seen.

Based on the findings of the current study, empowering pre-hospital emergency staff by continuous education leads to a 14.5% decrease in unnecessary cases and a 5.6% drop in unnecessary visits in ED.

The most frequent causes of decrease in transfer belonged to lower back pain, mental problems, and direct trauma. In addition, the most frequent causes of a decrease in mistakenly not transporting the patient when it was necessary belonged to trauma and pediatric cases. Transporting the patient is a major and important activity in the healthcare system and so much money is spent on optimizing this system [5]. Based on previous findings, referring patients who lack indications have led to an increase in hospital expenses [6,7]. Transfer of non-emergency patients to ED has resulted in misuse of the resources; therefore, the patients who need these resources are not able to use them when necessary [3,8].

In a study on the importance of managing to not transfer non-emergency patients, Hains et al. have deemed the staff feeling responsibility, time of transportation, correct initial history taking, and effective and safe transportation and effective in deciding not referring the patient [1].

The results of a systematic review on the referral of critically ill patients really in need of referral showed that by training and adding to the knowledge of the paramedic technicians the number of referrals without indication decreased, error cases dropped and costs of unnecessary referral and hospitalization decrease [2,5].

The results of some of the studies also indicate the decrease in cases of referral to ED after coordinating with rehabilitation centers and homes for the aged patient [8-10]. Additionally, training pre-hospital emergency staff and increasing their knowledge has led to an increase in the safety of patient transportation and

improvement in the function of pre-hospital emergency service [4,11].

However, the results of a study by Deasy et al. were in contrast to this. They have concluded that rapid referral of non-emergency patients is more effective than not transferring them [12].

In the study by Richards et al. out of 887 patients asking for pre-hospital emergency services, 501 patients were real emergency cases. Meanwhile, 689 patients believed that they needed to be transferred rapidly. In this study, blunt trauma and an altered level of consciousness were the most common reasons for referral [13]. In our study also the majority of multiple trauma patients and loss of consciousness cases were referred considering the dangerous nature of the problem and most of the patients who called EMS believed that they were real emergency cases and in need of rapid transportation to ED.

The important point that should be noted in the findings of the present study is the significant decrease in referral regarding cases with some specific complaints such as lower back pain. Meanwhile, patients with cardiac complaints had the lowest change in transfers due to the dangerous nature of the problem, and even after training, there was no significant change in their rate of referral.

It seems that training of pre-hospital emergency staff can significantly decrease cases of unnecessary referral to ED and in turn lower overcrowding in the department as well as hospital expenses. Holding training courses can lead to improvement of function among staff and decrease of error in their decision regarding referral of the patient. For this purpose, EMS operators who are responsible for answering the calls of those contacting this emergency service should be selected from the most knowledgeable trained staff (bachelor of nursing, medical emergencies assistant) to provide the required guidance to the callers in various cases and prevent the unnecessary dispatch of an ambulance. The presence of physicians in the communication unit is another way for reaching this goal.

Finally, informing the general population via preparing and distributing educational brochures and using other existing media, explaining matters such as emergency resources and how to use them efficiently can be very helpful.

Based on the findings of the present study, empowering pre-hospital emergency staff by continuous education leads to a 14.5% decrease in the unnecessary transfer of the patient to ED and a 5.6% drop in unnecessary visits in ED.

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**Footnotes**

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**Conflict of Interests:** Hereby, the authors declare that there is no conflict of interest regarding the present study.

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**Informed Consent:** Participants were enrolled in the study after signing an informed consent form.

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