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# Efficacy of pre-hospital care in trauma patients in Iran

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## ABSTRACT

**Objectives** Pre-hospital care plays a vital role in the management of trauma patients. The present study was designed to evaluate the efficacy of the pre-hospital care performed by the Tehran Emergency Medical Service (EMS) in trauma patients.

**Methods** The prospective study was performed on trauma patients referred to the emergency department of a teaching hospital by the Tehran EMS from September 2004 until 2005. Considering the lack of scientific observation-based protocols on pre-hospital care, certain protocols were developed based on the available up-to-date protocols in the emergency medicine text books and were used as the gold standard for comparing the provided care by EMSs.

**Results** The effectiveness of pre-hospital care performed by Tehran emergency technicians, compatible with the patients' condition, was evaluated in 994 patients. Wound bandaging and haemostasis were done correctly in 80% of the indicated cases. Splint was applied correctly in 50% of patients in need for such a device, whereas collar and spinal bed were not performed in 80% of the indicated cases.

**Conclusions** Tehran's EMS is not capable of providing trauma patients with effective and accurate pre-hospital care, indicating that major changes are needed to improve this.

## INTRODUCTION

Trauma is the fourth common cause of mortality after cardiac disease, cancers and strokes. While the mean age of deaths due to cardiac disease and cancer is 76 and 68 y, respectively, the majority of car accident related deaths occur in young individuals.<sup>1</sup>

In Iran, more than 25 700 deaths—33 deaths per 10 000 vehicles—were reported in 2003; there had been on average one death every 20 min, which is considerably higher compared to the majority of the neighbouring countries.<sup>2 3</sup>

Many factors, such as the conditions of roads and cars, which are reported to be far behind the accepted global standards, along with the fact that many drivers do not follow the driving legislations, contribute to the higher mortality rate in the victims of car accidents in our country. In addition to this, pre-hospital care is considered as a key factor in determining the outcome of trauma patients.

The chief goal of an emergency system is to provide immediate and accurate medical services.<sup>4</sup> While the recommended time between receiving the notification and reaching the accident scene should be about 8 min,<sup>5</sup> in Iran the interval is 25 min on roads and 10 min in large cities; however, in Tehran the time reaches 15 min due to the heavy traffic jams.<sup>2 3</sup>

However, in 1961, Van Vangoner reported that the emergency system is insufficient in many countries.<sup>6</sup> In Iran the performance of pre-hospital

emergency services has never been fully assessed; however, many reports have revealed that many individuals prefer taking their patient to the hospital in person in emergency cases rather than calling the emergency services, adding that emergency services provide the required care in merely 20% of the emergency cases. In other words, the report highlights that from the public's point of view, the emergency service is not capable of performing its role; therefore, our study was designed to evaluate the efficacy of the service provided for trauma patients referred to a teaching hospital by Tehran's EMS.

## MATERIAL AND METHODS

After being approved by the ethics committee of Tehran University of Medical Sciences, the descriptive, prospective study was conducted on trauma patients referred to the emergency department of our teaching hospital—a referral trauma centre in Tehran—by Tehran's Emergency Medical Service (EMS) during September 2004 and September 2005. It should be noted that according to the Iranian legislations, Tehran's EMS should take patients to the nearest teaching hospital rather than a private hospital.

Considering the lack of scientific observation-based protocols on pre-hospital care in Tehran's EMS, requisite protocols were developed by a panel of experts based on the available up-to-date protocols and emergency medicine text books and used as the gold standard for comparing the care provided by the EMS.<sup>7–11</sup>

The residents in charge of admitting patients in the emergency department participated in a 2-week course in which these protocols, along with the indications and contraindications for performing each care, were completely discussed.

At the time a trauma patient arrived at the hospital, the admitting resident in the emergency department completed a pre-prepared questionnaire using the form completed by Tehran's EMS personnel and based on his/her own clinical observations regarding the patient's condition.

The patients' demographic information (age and gender), the time and the mechanism of injury, and the presence or absence of a physician in the ambulance were recorded.

The care provided by emergency medical teams (EMTs) was compared with the developed protocols based on the patient's condition; the sufficiency or insufficiency of the provided pre-hospital care was also added to the questionnaire. The performance of these residents was regularly evaluated during the study period with the aim of eliminating any possible bias in completing the forms and comparing the care provided by EMTs and the devised protocols.

The gathered data was entered in SPSS (version 13). The frequency of the studied factors was determined using mean  $\pm$  SD and percentage.  $\chi^2$  was used to compare the care provided by EMTs and the physicians sent out in the ambulance.

## RESULTS

In total, 994 patients with the mean age of  $34.12 \pm 16.55$  y (ranging between 1 and 95 y) were enrolled in the study; 87.6% of them were men.

The majority of these casualties occurred in May and June; there were no trauma admissions during June and July because of the breakdown of the hospital's CT-scan system.

Car accident (81%) followed by falls (9%) and fights (7%) accounted for the majority of the referred cases with stab wounds and gunshot wounds accounting for a very small group of the injured patients (2%).

Motorbike riders made up 64% of car accidents—72% were riders and 28% were rear passengers—whereas pedestrians (29.5%) and car passengers (4%) made up a smaller number of the accidents. Among car passengers, 61% were drivers, 32% were front passengers and 7% were rear passengers. Only 30% of the injured drivers had fastened their safety belts and merely 27% of the motorcyclists had worn helmets.

Falling from less than a 4-m height comprised the majority of the fall accidents. Similar to other mechanisms of injury, falls were more frequent among men yet there was no specific age preference. However, falls from more than a 4-m height were more frequently reported among those younger than 50 y of age.

Most Tehran EMS ambulances were sent out with two technicians, indicating that physicians were present in 26% of Tehran EMS ambulances. There was a significant difference between the faults reported in the presence or absence of a physician (table 1).

Table 2 outlines the performance of EMTs in providing the trauma patients with the required pre-hospital care. According to the data listed in this table, bandage and wound haemostasis were either not performed or performed inadequately in 23.2% and 24.8% of the cases when needed, respectively. In almost 50% of the indicated cases, splint was not used. Moreover, airway management, suctioning, oxygen tracheal tube, collar and spinal bed were not placed in the majority of the patients in need of such devices.

Despite the fact that peripheral intravenous (IV) line catheters were inserted in 91.2% of the patients transferred to the hospital, the catheter was not functional in 23 cases. No IV solution was prescribed in about 80% of the transferred patients. Ringer (59%) and normal saline (27%) were the most frequently used IV solutions in the studied patients. Other solutions, including dextrose saline and dextrose water 5%, were also

prescribed in certain cases. The 20 G (pink ISO colour) and 16 G (green ISO colour) accounted for 46 and 42% of the catheters applied in these patients, respectively.

Dexamethasone was the most commonly used drug in ambulances; 12% of the patients received the medication in the ambulance; however, spinal trauma was only reported in 30% of these cases (25 patients).

## DISCUSSION

The quality of medical services offered to the injured individuals by EMTs depends on the accurate assessment of the patient's status and performing the required procedures, including airway management, monitoring breathing and ventilation status, maintaining the blood flow and controlling bleeding, checking and stabilising the spinal cord if required and assessing the Glasgow Coma Score (GCS) and level of consciousness properly. It should be stressed that these simple procedures play a critical role in the outcome of the patients—for instance, fixing the cervical and lumbar spinal column using a collar and a spinal bed, particularly in individuals stuck in a vehicle or those who have fallen from a height, prevents spinal damage and the possible subsequent irreparable consequences (quadriplegia or paraplegia).<sup>12</sup> Similarly, splints reduce the subsequent vascular and neural complications in the required cases.<sup>12</sup>

Pre-hospital technicians receive the necessary training in basic medical emergency courses within a short period of time (about 4–5 months); however, devising protocols or instructions for providing pre-hospital care facilitates this process.<sup>4 13</sup>

At the time of the present study, EMTs were selected among individuals who had passed a 1-month course with the aim of learning the required procedures. These EMTs were permitted to perform regular procedures performed during pre-hospital care such as providing oxygen, airway management, tracheal tube insertion and suctioning, placing a splint or spinal bed. Our study reported that the Tehran EMS staff do not provide patients with accurate pre-hospital care based on scientific and standard protocols. The urgency of transferring the casualty to the hospital on one hand and the absence of the required equipment in the ambulance or required skills for fulfilling such procedures on the other hand may have contributed to the deficiencies in performing these simple procedures.

Moreover, the fact that IV solutions were not prescribed for the majority of the patients in our study cannot be justified based on the two acceptable approaches in trauma patients regarding IV-line catheters. In the first approach, EMS personnel are asked to transmit the patient to the hospital in the shortest time possible, inserting IV-line catheters only in the cases of necessity. However, in the second approach, IV-line catheters are routinely inserted in all casualties on the accident scene.<sup>10 14</sup>

**Table 1** Ambulance faults in the presence or absence of a physician

Procedure not performed when indicated	Airway	Oxygen	Tracheal tube	Suction	Haemostasis	Bandage	Collar
Without a physician	3%	9.4%	1.6%	2.7%	6%	8%	16.6%
With a physician	—	8.8%	0.4%	—	2.3%	2.3%	13%
	0.023	0.419	0.111	0.049	0.068	0.007	0.222
		<b>Non-functional IV-line</b>		<b>Prescribing medication when not required</b>		<b>Not prescribing IV solution in the presence of IV-catheter</b>	
Without a physician		10%		3%		6%	
With a physician		9%		—		2.3%	
		0.267		0.023		0.047	

## Prehospital care

**Table 2** Emergency medical team's performance in providing pre-hospital care

Pre-hospital care	Indication +			Indication -	
	Performed when needed	Performed inadequately when needed	Not performed when needed	Performed when not needed	Faults in the performance (%)
Airway	6	3	11	—	70
O <sub>2</sub>	18	2	76	12	81.2
Tracheal Tube	2	2	10	1	85.7
Suction	3	2	8	—	76.9
Bandage	189	17	40	—	23.2
Haemostasis	127	35	7	—	24.8
Splint	306	130	165	2	49.1
Spinal bed	19	31	52	—	81.4
Collar	19	77	74	—	88.8

Additionally, the use of 20G cannulas in most of the studied cases while 16 and 18 G cannulas are generally recommended for adult trauma patients<sup>15</sup> could be contributed to the ease of using larger cannulas or the personnel's lack of proficiency in choosing the most accurate size.

Similarly, the use of dextrose saline and DW 5%, which are not routinely recommended in trauma patients due to the high risk of several complications following their use, such as cerebral oedema,<sup>16</sup> may be because of the insufficient knowledge of the personnel or lack of proper IV solutions in the ambulance.

While many studies report that dexamethasone should not be prescribed in trauma patients except in cases of spinal injuries,<sup>7 8</sup> some patients in our study received the drug in the absence of the above mentioned condition. This could be explained by the fact that many of the EMS staff followed the old protocols recommending the drug with the aim of reducing trauma-related complications.

## CONCLUSION

The present study revealed the inefficacy of the pre-hospital care provided for trauma patients by the Iranian EMS system. Lack of up-to-date protocols and training courses are considered as the main reasons contributing to the ineffectiveness of the care provided by this system. However, other limitations, including the low quality of national emergency services, the shortage of ambulances and an ageing ambulance fleet, few EMS stations across the country and the absence of public awareness about the EMS, have also contributed.

Therefore, the Iranian EMS has started a fundamental programme to revolutionise its fleet by increasing the number of EMS stations, adding new ambulances equipped with intensive care unit equipments and improving the during-service education following this study. Authorities have also started compiling evidence-based standard protocols and training the emergency technicians based on these protocols; it should be noted that EMS authorities are looking forward to benefiting from the strengths and the weaknesses of the available EMSs in other countries in order to develop the best possible emergency system in the country. In addition, physicians specialising in emergency medicine, which is a new specialty in our country, are included in this national programme not only to develop the new protocols but also to help educate EMTs, who are now selected among those with related certificates who have passed necessary training courses, and physicians who are going to be sent out in the ambulances.

As a result, a further study is needed to evaluate the efficacy of these changes in improving the current conditions based on the results revealed in this study.

## LIMITATION

The severity of the injury in patients referred to our emergency department is not routinely assessed using an objective measurable scale such as the Injury Severity Score or Revised Trauma Score; as a result we were not able to evaluate the efficacy of the pre-hospital care regarding the severity of injury. It would be a good idea to assess these factors in a further study, which is going to assess the efficacy of pre-hospital care after necessary changes are made in the EMS system.

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**Competing interests** None.

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