

# Prehospital care and interfacility transfer of trauma patients before reaching the emergency of a level-1 trauma care center

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## ABSTRACT

**Background:** Management of trauma patients includes prevention, prehospital care, appropriate resuscitation at a hospital, definitive treatment, and rehabilitation. Timely and adequate care for a trauma patient is paramount, which can dramatically impact survival. This study was planned to assess the proportion of patients who failed to receive adequate prehospital care before reaching our institute. **Materials and Methods:** A retrospective study was conducted in the trauma and emergency department of a level-1 trauma center in eastern India from February to April 2022. The demographic profile, vital parameters, injury, mode of transport, travel duration, referring hospital, and any interventions as per airway/breathing/circulation/hypothermia were collected. **Results:** The records of a hundred-two patients who were brought to the trauma and emergency department in the study period were reviewed. Road traffic accident involving two wheelers was the leading cause of injury. Eighty-three percent of the patients were referred from other health centers, of which 49 were referred from district headquarters hospitals. Only three patients out of 14 had been provided with an oropharyngeal airway for whom endotracheal intubation was indicated. Only one among the 41 patients needing Philadelphia collar actually received. Sixteen patients were provided supplemental oxygen out of the 35 for whom it was indicated. Out of 68 patients in whom intravenous cannulation and fluid administration were indicated, only 35 patients had received it. Out of 31 patients with fractures, none were provided immobilization. **Conclusion:** The care of the trauma patients with respect to airway, breathing, circulation, and fracture immobilization was found to be grossly inadequate, emphasizing the need of structured and protocol based prehospital trauma care.

**Keywords:** Advanced trauma life support care, prehospital emergency care, traffic accident, transportation of patients

## Background

About 1.35 million people die annually due to road traffic accidents, which are the leading killer of people aged 5–29 years. The death rate amongst injured people before reaching the hospital is twice as high in low-middle-income countries (LMIC)

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as compared to high-income countries.<sup>[1]</sup> Among all LMICs, India contributes to one-fifth of the global burden of injuries, with over a million injury-related fatalities annually. Though primary injury prevention is an important goal, prehospital management is crucial in reducing morbidity and mortality. Approximately 50% of trauma deaths occur within the first hour of injury, and an additional 30% of deaths occur within 24 hours of arrival at a hospital.<sup>[2]</sup> So, timely and adequate care for a trauma patient is paramount and can dramatically impact survival. Quick response and adequate management during prehospital care may improve the outcome of trauma patients.<sup>[3]</sup>

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Primary care physicians play a vital role in managing trauma patients because most of these patients are brought initially to primary health centers.

Only a few literature on prehospital care for trauma patients are from other regions of India, but data from the eastern part are lacking. We planned this study to assess the prehospital care being provided to an injured patient by the referring hospital or ambulance personnel in the eastern region of India. The study's primary objective was to detect the proportion of patients not receiving adequate prehospital care (an intervention indicated as per the advanced trauma life support guidelines) before reaching our institute. The secondary objective was to detect the travel duration and mode of transport used for patient transfer. This study will help find the status of prehospital care in this part of our country, which may help improve care for trauma patients in the future.

## Materials and Methods

Retrospective data of patients aged 18 years or more with a history of trauma who were brought to the trauma and emergency department of a level-1 trauma center were collected. The demographic profile, vital parameters, date and time of injury, mechanism of injury, date and time of reaching, duration of travel to reach the study center, referring hospital, mode of transport, and any interventions of airway/breathing/circulation/hypothermia were collected. The sample size was estimated using the formula for estimating a single proportion. The anticipated prevalence of non-receipt of prehospital care among the trauma patients coming to the emergency department was 50%. The sample size was estimated with 10% absolute precision and a 95% confidence level. The estimated sample size was 96 trauma patients. Descriptive statistics were used for analyzing the data. The statistical analysis was done with IBM SPSS (version 20).

## Results

A total of 102 patient data were collected from the records of February to April 2022. The mean age of the patients was 39 years ( $\pm 15.39$ ) [Table 1]. There were 77 male patients. Upon arrival at the emergency department, the mean heart rate, blood pressure, and respiratory rate were 90/min, 124/75 mmHg, and 19 breaths per minute, respectively. The median alert verbal pain unresponsive (AVPU) score, glasgow coma score (GCS), and injury severity score (ISS) were 1, 15, and 16, respectively [Table 1]. A road traffic accident (RTA) was the leading mechanism of injury (77%), and two-wheelers (45%) were major vehicles involved. About 32% of cases had musculoskeletal and head injuries. There were multiple fractures in 19% of patients. Most patients were brought in the evening and night [Table 2]. The median duration of injury-to-hospital reporting time was 250 minutes, and the median transport duration was 90 minutes. Most patients were referred from other health centers (83%). The referring health centers were district

**Table 1: Demographic profile and vitals at arrival**

Variables	n=102
Age in years (Mean $\pm$ SD)	39 $\pm$ 15.39
Gender (M/F)	77/25
Vitals	
HR (Mean, SD)	90 (19.2)
>100	23
<60	5
SBP (Mean, SD)	124.8 (25)
<90	4
DBP (Mean, SD)	75.5 (13.2)
<60	8
Respiratory rate (Mean, SD)	19 (4.3)
>20	23
<12	1
AVPU (Median, IQR)	1 (1–3)
GCS (Median, IQR)	15 (11–15)
Score 13–15	71
Score 9–12	13
Score 3–8	18
ISS (Median, IQR)	16 (4–45)
Mode of injury (n=102)	
RTA	79
Domestic/fall from height	10
Occupational injury	5
Assault	4
Animal attack	2
Hanging	1
Burn injury	1
Injury types	
Musculoskeletal	33
Head	32
Chest	19
Sift tissue	13
Maxillofacial	10
Spine	9
Abdominal	3
Burn	2
Multiple fracture	19

AVPU—Alert-verbal-pain-unresponsive score, DBP—Diastolic blood pressure, GCS—Glasgow coma scale, HR—Heart rate per minute, ISS—Injury severity score, RTA—Road traffic accident, SBP—Systolic blood pressure

headquarters hospitals (49%) and primary health centers (12%). Most of the patients were transported by ambulance (89%).

Among the patients brought to our institute by ambulance or referred from other health centers, none received endotracheal intubation (ETT), although it was needed in 14, and a Philadelphia collar was applied only in one of the 41 where it was necessary [Table 3]. Only three patients (21%) had been provided with an oropharyngeal airway and one (2%) received Philadelphia collar when it was indicated. For breathing, 16 patients (45%) had received the required supplemental oxygen. At least 35 patients should have been supplemented with oxygen, and four patients should have been inserted with an intercostal chest drain. Sixty-eight patients should have been inserted with a wide-bore intravenous (IV) cannula and IV fluids. Only 35 patients have been administered IV fluids. None of the patients with fractures had been provided immobilization.

## Discussion

In our study, the mode of injury was RTA in 77% of the patients. The figures were similar to other studies conducted in Indian subcontinent which found the proportion to be approximately 70%.<sup>[4,5]</sup> The mean duration of seeking medical care after injury was about four hours in our study, but it ranged from 4.25 to 8.6 hours in some previous studies.<sup>[6,7]</sup>

The ETI was required in 15% and chest tube insertion in 4% of patients at arrival in our study. Dharap *et al.*<sup>[7]</sup> have earlier reported the need for ETI and chest tube insertion in their study population in 38% and 15% of patients, respectively, within an hour of arrival. In another study, about 15% of trauma patients had an airway, breathing, or circulation compromised or a head injury with a GCS <8. Two-thirds of cases were referred from other healthcare facilities. About 5% of the cases required intubation at presentation.<sup>[8]</sup>

The Philadelphia collar was applied only to 2.4% of the indicated trauma patients in our study. In a study by Newberry *et al.*,<sup>[9]</sup> the cervical collar was not applied to 46% of the potentially

indicated patients. Oxygen was supplemented in 45% of trauma patients, and IV fluids were administered in 51% of those, as indicated in our study. IV fluids were administered in 34% of patients, and oxygen was supplemented in 66% of patients.<sup>[9]</sup> About 4% of patients had hypotension and 18% had GCS <9 in our study. Dharap *et al.*,<sup>[7]</sup> found hypotension (systolic blood pressure <90 mmHg) and GCS <9 in 28% of their patients.

Eighty-three percent of the patients were referred from other hospitals in our study. However, the desired interventions as per indication remained deficient. In a study, at the scene of the injury and throughout transportation, none received minimum care, including vitals monitoring, IV fluid administration, or airway protection.<sup>[5]</sup> Previous studies have found that 56–70% of patients were referred to an emergency setup from other smaller or less equipped health facilities.<sup>[7,10,11]</sup> Despite referrals from other healthcare setups, the proportion of patients receiving appropriate treatment at the referring hospital has been found to be dismally low (8%).<sup>[10]</sup> Some studies have found the absence of any prehospital trauma care in as much as 50–85% of trauma patients.<sup>[12,13]</sup>

Rural and remote areas lack quick life-saving treatments and safe transfer to an appropriate healthcare facility. Due to a lack of interdisciplinary support, small hospitals, and private clinics cannot handle polytrauma. Very few of the primary care physicians at the primary health center and community health center levels had ever taken trauma care continuing education courses. Also, there is a shortage of low-cost consumables and equipment.<sup>[14]</sup> Only uncomplicated extremity injuries could be treated with the available resources; patients with polytrauma and severe injuries were referred.<sup>[15]</sup> The patients transported directly to a tertiary trauma care center had better survival than those transferred from other health centers.<sup>[7]</sup> Most ambulances are used for inter-hospital transfer rather than as the primary response. Usually, unskilled members of the general public are the ones who shift the patients. Regardless of the ability to handle it, trauma patients are frequently transported to the nearest hospital.<sup>[16]</sup> Most ambulances provide only transportation to medical facilities; they do not provide pre-hospital care.<sup>[17]</sup>

**Table 2: Transport details**

	<i>n</i>
Reporting time	
8 AM–2 PM	20
2 PM–8 PM	28
8 PM–8 AM	54
Duration after injury* (Median, IQR)	250 (151.2–518.7)
Travel duration* (Median, IQR)	90 (60–120)
Brought to emergency department	
Directly/referred	17/85
Referring hospital (n=85)	
District Headquarter Hospital	50
Primary Health Centre	12
Medical College	10
Community Health Centre	7
Sub-Divisional Hospital	6
Mode of transport (ambulance/other vehicles)	91/11

\*In minutes

**Table 3: Interventions accomplished by ambulance personnel/referring hospital as per ATLS protocol before reaching our center (n=91)**

Intervention indicated	<i>n</i>	Intervention accomplished	<i>n</i>
Airway			
ETI	14	ETI	0
		Oropharyngeal airway	3
Philadelphia collar	41	Philadelphia collar	1
Breathing			
Supplemental oxygen	35	Supplemental oxygen	16
Chest tube	4	Chest tube	1
Circulation			
Wide bore IV cannula and IV fluids	68	IV cannulas (small bore) and IV fluids	35
Fracture immobilization	31	Fracture immobilization	0
Hypothermia prevention	27	Hypothermia prevention	20

ETI—Endotracheal intubation, IV—Intravenous, ATLS—Advanced trauma life support

A prospective study in our institute found that 76% of the ambulance personnel had no paramedical degree. The knowledge of basic life support was poor for 63% of ambulance personnel.<sup>[18]</sup> Though there was no correlation between prehospital duration and 30-day death in trauma patients, longer prehospital time was deleterious for functional outcomes.<sup>[19]</sup>

Quick airway, breathing, hemorrhage control, and spinal board immobilization need to be done on the spot. A prior intimation must be sent to the receiving hospital at the start of transport. Treatment, including getting IV access should be continued while transported to the hospital.<sup>[20]</sup> It is necessary to develop a large workforce of prehospital care providers with training and operations standards who can start providing first aid before an ambulance arrives.<sup>[21]</sup>

## Conclusion

The prehospital care and the initial assessment of trauma patients in peripheral referring hospitals are grossly lacking. Delay in the transfer of the patient prevents it from reaching the golden hour, which can prove detrimental. Appropriate measures on a large scale and regular training for the doctors in the referring hospitals and paramedical staff of ambulances can extrapolate to lesser morbidity and mortality in the patients of trauma.

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## Conflicts of interest

There are no conflicts of interest.

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