

Original Article

## Inter-hospital transfer of trauma patients in a developing country: A prospective descriptive study

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### Abstract

**Introduction:** During interhospital transfer patients are at risk due to possibility of serious complications. There are no guidelines governing the transfer of injured patients in India. It is important to identify the extent of the problem in the transfer process of the injured transferred to the trauma centre.

**Methods:** On arrival in the Emergency Department patients were assessed for clinical status and the Glasgow Coma Score (GCS). The transfer vehicle was evaluated and the accompanying transfer personnel was interviewed to record details of the transfer process, training of the transfer personnel, adequacy of the transfer vehicle and its outfitted monitoring equipment. Data communicated to the trauma centre from the referring hospitals were also collected from the transfer records. The transferred group was compared to the non-transferred group.

**Results:** Of the 592 patients admitted, 572 consented to the study. 327 were referred patients and 245 were directly admitted patients. Patients referred from peripheral hospitals had significantly lower GCS, higher ISS, higher admission gap and longer duration of hospital stay. The date and time of injury was documented in none of the referred patients, referral time in 44 (13.71%) cases, pulse rate in 110(34.38%) patients, blood pressure in 112 (34.25%) cases. The request for transfer was made in only 3 (0.93%) cases. Twelve cases (3.66%) were accompanied by a paramedic or a nurse. Intravenous access and infusions in progress were present in 192/327 (58.71%) transferred patients. Urethral catheters were present in 49 (15.17%) patients. Only 9/327 (2.79%) transferred patients had hard cervical immobilization. Hypotension at admission defined as a systolic BP < 120mm of Hg was present in 106 referred admitted cases.

**Conclusion:** This study suggests that the injured patients are not being transferred in a manner that is consistent with evidence based guidelines which are known to minimize the known hazards of transfer process and consequently improve outcome. Despite the efforts being made, the condition as of now is unacceptable and needs a rational referral policy contributed to and agreed by all service providers which must be strongly enforced without delay.

### Intorduction:

National Crimes Record Bureau is the principle agency responsible for collection and dissemination of trauma related statistics in India. It defines accidental deaths as deaths occurring due to accidents or due to natural calamity. In its annual report on accidental deaths in India it reported 390884 accidental deaths in the year 2011 (1.6% more than such deaths reported in the year 2010)<sup>1</sup>. For the decade 2001 – 2011, the increase in accidental deaths in India is 44.2% while the population growth in India during the same period was 17.8%<sup>1</sup>.

Uttar Pradesh is the most populous state of India has a death per accident rate of 53.5%, which is more than 2 times the national average of 26.9%<sup>1</sup>.

Chattrapati Sahuji Maharaj Medical University is the principle tertiary care centre of Uttar Pradesh with about 3000 beds, well-equipped super speciality services and the only trauma centre of Uttar Pradesh. The trauma centre of Chattrapati Shahuji Maharaj Medical University (CSMMU) serves the needs of rural and urban areas of Uttar Pradesh up to a radius of 100 miles. It provides 24 hour receiving of trauma patients in the emergency

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department and 24 hour specialty surgical coverage. Due to the large geographic area and economic constraints, many trauma victims are first admitted to inadequately equipped primary or secondary care hospitals and thereafter transferred to the trauma centre for investigation and management.

During interhospital transfer patients are at risk due to possibility of numerous complications like hypoxia, hypotension, hypercarbia, convulsions, intracranial haematoma and neurological deterioration<sup>2-4</sup>. Most countries follow existing guidelines to govern the safe transportation of injured patients<sup>5-7</sup> but no such guidelines or referral systems exist in India.

The goal of this study was to identify the critical problem areas in the transfer of injured patients to the CSMMU. The aims of this study were to identify whether there were substantial differences between transferred and directly admitted patients and to identify the major gaps in standard of care for transferred patients.

### **Material and Methods:**

Trauma victims arriving at the CSMMU trauma centre present to the Emergency Room where they are resuscitated and stabilized. Once stabilized, they are transferred to the care of the specialist surgical teams for definitive management. "We prospectively evaluated all consecutive trauma patients who were admitted to the trauma centre on Mondays (during the 24 hr period of 8:00 am Monday to 8:00 am Tuesday) for a period of one year." Patients not requiring admission were not included in the study. Additionally data was collected on patients admitted on Wednesdays and Saturdays of 8 randomly selected weeks. Patients admitted on Wednesday and Saturdays were compared among themselves and with those admitted on Mondays of the same 8 weeks to determine whether day of admission made any difference on patient characteristics.

A single investigator independently assessed all patients upon arrival in the Emergency Department to determine their clinical status and assess the Glasgow Coma Score (GCS). The investigator then evaluated the transfer vehicle and interviewed accompanying transfer personnel to record information on the clinical status of the patients during transfer, details of the transfer process, training of the transfer personnel, adequacy of the transfer vehicle and its outfitted monitoring equipment. Data communicated to the trauma centre from the referring hospitals were also collected from the transfer records. Since the peripheral hospitals do not

have access to internet and no data is transferred electronically by them, no attempt was made to collect it. The admitted transferred group was then compared to the admitted non-transferred patient group and the variables reviewed. These included gender, age, Injury Severity Score (ISS), organ of injury distribution, presence of comorbidities, below poverty line status, necessity of operative management, need for tracheostomy, need for ICU admittance and mortality. These data were recorded in a Microsoft Excel worksheet and analysed using the Statistical Package for the Social Sciences (SPSS) version 10.0. Bivariate analysis was done to compare directly admitted and referred admitted groups.

The study was done as a part of Indian Council of Medical Research sponsored MD Phd programme of CSMMU. Permission for the study was provided by the Institutional review board. Patients were included in the study subject to written informed consent.

### **Results:**

During the study period, there were 592 eligible patients were admitted to the CSMMU trauma centre. Of these 572 consented to the study. Of these 572 patients, 327 were referred patients and 245 were directly admitted patients. There were 478 males and 94 females with a median age of 38 years. The cause of injury was road traffic accident in 407 cases, fall in 119 cases, assault in 23 cases, gunshot or stab wound in 15 cases, and 6 patients sustained injury due to a pedestrian being hit by an animal. In three cases the mechanism of injury was not known.

The baseline characteristics among the patients admitted on different days of the same eight randomly selected weeks were compared and found to be similar on the parameters age, sex, and mortality, status at discharge, ISS and admission gap ( $p > 0.17$ ). There was no consistent or particular increase in referred or directly admitted patient flow on the different days of the week.

Patients referred from peripheral hospitals had significantly lower GCS, higher ISS, higher admission gap and longer duration of hospital stay. Admission through referral was significantly associated with possession of BPL card ( $p$  value 0.0215). Patients referred from peripheral hospitals had a trend towards higher operative rates (0.544 operations per patient vs. 0.461 operations per patient), lower blood pressure at admission, a greater proportion of head injuries and higher proportion of female patients but the differences

did not reach statistical significance. Hypotension at admission defined as a systolic BP < 120mm of Hg was present in 106/317 (32.41%) referred patients

without neurogenic shock. 148/327 (45.25%) of the referred patients required operative intervention while 102/245 (41.63%) of the directly admitted patients required operative intervention. Table 1.

**Table 1: Comparison of referred and directly admitted cases**

Quantitative variable	Through referral			Direct admission			P
	N	Mean±SD	Median	N	Mean±SD	Median	
Age	327	41.11±16.4	40	245	40.40±16.1	37	0.5994
ISS	327	13.08±7.4	9	243	11.87±7.2	9	0.0536
RR	327	22.02±5.5	20	245	21.38±6.2	20	0.1248
GCS	311	11.87±4.2	15	226	12.66±3.9	15	0.0296
Admission gap in HRS	327	78.02±235.0	14.92	245	22.44±68.8	5	<0.0001
Hospital stay (Days)	327	10.89±12.3	7	245	9.25±13.3	6	0.013
<b>Operative rates</b>		<b>.544/patient</b>			<b>.461/patient</b>		<b>0.1677</b>
<b>Qualitative variables</b>	<b>N</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>N</b>	<b>%</b>	
Female sex	327	62	18.96	245	32	13.06	0.0596
<b>Previous associated morbidities</b>							
CAD	327	8	2.45	245	9	3.67	0.3925
COPD	327	16	4.89	245	11	4.49	0.8223
Hypertension	327	16	4.89	245	10	4.08	0.6448
Renal disease	327	2	0.61	245	2	0.82	0.7713
Diabetes mellitus	327	14	4.28	245	1	0.41	0.003
<b>Tracheostomy at CSMMU</b>	327	22	6.73	245	5	2.04	0.0089
<b>BPL Card</b>	327	73	22.32	245	36	14.69	0.0215
<b>Injury Distribution</b>							
Head injury	327	115	35.17	245	68	27.76	0.06
Head injury combined with any other injury	327	33	10.09	245	29	11.84	0.506
Single segment of an extremity	327	95	29.05	245	81	33.06	0.304
>1 segment of an extremity or >1 extremity	327	21	6.42	245	22	8.98	0.251
Other poly trauma	327	24	7.34	245	16	6.53	0.707
Cervical spine	327	14	4.28	245	13	5.31	0.567
Thoracic Spine	327	5	1.53	245	3	1.22	0.759
Lumbar spine	327	3	0.92	245	3	1.22	0.721
Chest	327	9	2.75	245	7	2.86	0.94
Abdominal trauma	327	7	2.14	245	2	0.82	0.208
Face	327	1	0.31	245	1	0.41	0.837

Referral from a peripheral hospital was not significantly associated with mortality (27% in referred group versus 22% in direct access;  $p=0.182$ ,  $OR=.91$ ). However the median ISS was 9 in both the groups and 176/327 (53.28%) of the referred cases had an ISS of  $\geq 10$ .

The level of documentation in transfer records from the referral hospital accompanying the patient at the referral hospitals was generally sub-optimal. The date and time of injury was documented in none of the 327 referred admitted patients, referral time in 44/327 (13.71%) cases by the referring hospitals. Only 110/327 (34.38%) patients had pulse rate and 112/327 (34.25%) had blood pressure recorded on the transfer documents. (Table 2.) No patient had a systolic BP  $< 90$  mm Hg and a diastolic BP  $< 60$  mm Hg recorded on the transfer documents. Pupil size and reaction, and GCS score were not documented in any of the cases, including the 245 head trauma cases. On arrival 71 patients had a GCS score of less than 8. Of these, none had been intubated in the referral hospital or on way.

The request for transfer was made in only 3 (0.93%) cases. All the cases were transferred using roads. Ambulances were used for transfer in 49 (15.12%) cases while the rest were transferred using a non-ambulance vehicles. There was equipment to measure blood pressure and pulse rates in 47/49 (95.91%) ambulances, but automated monitoring devices to measure blood pressure, heart rate and pulse oximetry were only present in one ambulance, that was privately operated. Functional equipment for suctioning were present in 22 (44.89%) of the ambulances. (Table 3). Equipment for intravenous access and intravenous fluids were present in 30/49 (61.22%) ambulances.

Intravenous access and infusions in progress were present in 192/327 (58.71%) transferred patients. The majority received physiological solutions i.e. Ringer Lactate or Normal Saline but non physiological solutions like 5% Dextrose in water was given to 22 (5.94%) patient. Urethral catheters were present in 49 (15.17%) patients. Only 9/327 (2.79%) transferred patients had hard cervical immobilization. Table 4. All of these were cervical spine injury patients. However 5 of the 14 cervical spine injury patients who were referred did not have any kind of cervical immobilization. None of the patients with  $< 8$  had cervical immobilization.

Twelve cases (3.66%) were accompanied by a paramedic or a nurse. A doctor did not accompany the referred patient in any of the cases. Two hundred and four (62.39%) of the 327 referred cases were referred

by a government run hospital while 123 (37.61%) had been referred by a private hospital or a private practitioner. All the patients who were accompanied by a nurse or paramedic had been referred by private hospitals.

**Table 2: Documentation on referral slips (N=327)**

Pulse rate	110 (33.63%)
Blood Pressure	112 (34.25%)
Referral Time	44 (13.45%)
Pupillary size and reaction	0 (0%)
GCS	0 (0%)

**Table 3: Equipment in ambulance (N=49)**

Oxygen	48 (97.95%)
Blood Pressure cuff manometer	47 (95.91%)
Equipment for iv access and iv fluids	30 (61.22%)
Suction	22 (44.89%)
Pulse Oxymeter	1 (0.02%)

**Table 4: Intravenous infusions present on arrival (N=327)**

Ringer Lactate or Normal Saline	170 (51.98%)
None	135 (41.28%)
5% Dextrose	22 (6.72%)

**Table 5: Protective patient devices in situ on arrival (N=51)**

Cervical Collar	9 (2.79%)
Endotracheal Intubation prior to arrival	0 (0%)
Urethral Catheterisation	49 (15.17%)
Nasogastric intubation	20 (6.11%)



## Discussion:

Trauma centre at CSMMU is the only trauma centre of Uttar Pradesh catering to the needs of trauma patients within a radius of 100 miles. There are other tertiary care centres that cater to trauma care but the principle centre for trauma care in Uttar Pradesh is the trauma centre at CSMMU. It receives patients referred from other tertiary care centres as well as those referred from secondary and primary care hospitals. The majority of patients are transferred by non-ambulance vehicles and are not accompanied by nurse, paramedic or doctor. One particularly worrisome finding was that none of the 71 patients with GCS scores < 8 had airway protection in the form of endotracheal intubation, contrary to all current recommendations<sup>5-7</sup>. Hypoxia and hypercarbia are substantial contributors to worsened neurologic outcomes from head trauma and other injuries. The lack of definitive airway establishment may reflect a lack of adequately trained personnel in the recognition of the need for airway protection and the lack of ability or supplies to do so. Additionally, minimal use of cervical immobilization prior to and during transfer is again contrary to international guidelines that state that cervical immobilization should be applied to all blunt trauma patients with GCS < 8 and certainly, all patients with a cervical spine injury. The lack of cervical spine immobilization may reflect the lack of suitably trained emergency department staff and/or lack of supplies at the referral hospitals. The choice of inadequate resuscitative intravenous fluids in 22 (5.94%) patients and the prevalence of untreated hypotension at arrival found in 106/317 (32.41%) referred patients without neurogenic shock signify delayed recognition of shock states and under resuscitation in patients.

Interhospital transfer of trauma patients is a potentially hazardous process due to a possibility of well documented complications like hypoxia, hypotension, hypercarbia, convulsions, intracranial haematoma and neurological deterioration<sup>2-4</sup>. The timeliness, duration and quality of transfer process itself may govern morbidity and mortality outcomes. Most countries follow existing guidelines to govern the safe transportation of injured patients<sup>5-7</sup> but no such guidelines or referral systems exist in India. These existing guidelines generally demand that a nominated consultant be available at the referring and receiving institutions; mutually agreed local policies between the institutions involved; thorough resuscitation and stabilization of all

patients prior to transfer; intubation and ventilation prior to transfer for patients with significantly depressed levels of consciousness; and mobile communication must exist between both units during transfer<sup>5-7</sup>. Monitoring of the patient during transfer should be similar to that in an intensive care unit<sup>5-7</sup>. In addition, the entire process should be the subject of education and audit and funding should be available at appropriate levels<sup>5-7</sup>.

Coordinated trauma care is possible only if an infrastructure exists for the transfer of injured patients<sup>8</sup>. An optimal system for transfer requires a central coordinating authority, a well-equipped ambulatory service, radio-communication between the ambulances and the receiving hospital, predefined arrangements between hospitals in the same geographical area, adequately trained paramedics and strict protocols of action<sup>9</sup>. Ideally, a trauma patient should be transported to the right hospital for the injury sustained. This may or may not be the nearest facility. If the closest facility is appropriate for initial stabilization subsequent transfers should be made as quickly and efficiently as possible.

In light of above known mediators of patient survival, the paucity of documentation of the patient's clinical status, the time of injury, time of referral was alarming, particularly in view of the fact that many of these were seriously ill patients as documented by their ISS scores. The finding that the vast majority of the referred patients were sent in non-ambulance vehicles, without an accompanying nurse, paramedic or a doctor most likely reflects the unavailability of ambulances and suitably qualified staff. This is one area that policy makers can focus on to improve the status of patient care. Lack of transfer requests to the receiving facility is also in contravention of modern accepted guidelines<sup>5-7</sup>. There were only 3 transfer requests and that too were solely due to personal effort of the sending physician. This common lack of a protocol incorporating transfer requests as a precondition to transfer points to a serious deficiency in a non integrated trauma system. A number of recent studies have reported reasons other than the patient's clinical status for patient transfer. These include gender, age, race, diagnostic and observational needs, specialist availability and referring facility's characteristics<sup>10-14</sup>. In our study the transferred patients had a trend towards lower GCS, higher ISS and required more operations per patient. Secondary "over triage" has been defined as referred patients with ISS <10, not requiring definitive operative care and

discharged within 48 hours of admission<sup>11</sup>. Of the referred patients, 87/327(26.6%) met secondary over triage definition. Secondary over triage is known to be a characteristic of a trauma care system in infancy and has been reported by other studies as well<sup>11,15</sup>.

The medical fraternity in India is well aware of the challenges in trauma care that exist and there have been sustained efforts to improve skills for trauma care. ATLS course –India program has set up several training facilities to impart ATLS courses to the medical fraternity in India. This study was conducted after about 1 year of commencement of training in India. However, neither an ATLS training faculty has been established in Uttar Pradesh nor has there been any effort by the Government of Uttar Pradesh to train its doctors at other centres till the time of writing of this paper. As principles of inter-facility transfer are an integral part of this course, it is hoped that these continued efforts will lead to an increase in the number of ATLS trained emergency department physicians, thereby improving the quality of patient care. Recently a Rural Trauma Team Development Program to develop a team of a physician, a nurse and a paramedic at rural primary and secondary care hospitals has been launched by National Disaster Management Authority of India, Jai Prakash Narain Apex Trauma Centre of All India Institute of Medical Sciences (AIIMS) – New Delhi, and state governments of Bihar, Andhra Pradesh and Assam. Safe transfer of the injured patient is an essential component of this programme as well.

Despite the efforts being made, the condition as of now is unacceptable and needs a rational referral policy contributed to and agreed by all service providers which must be strongly enforced without delay. On the basis of evidence generated by this paper and similar papers published elsewhere our recommendations are that:

- 1) All hospitals share a unified electronic medical record which can capture provider documentation, patient data, photos and videos.
- 2) All interfacility transfer ambulances must also have the ability to access, retrieve and update the electronic medical record of the patient regarding the patient's clinical status enroute to a higher level of care.
- 3) The decision to refer should be made just after the initial evaluation of the patient on the standard format of Electronic Medical

Records incorporating the guidelines for interhospital transfer.

- 4) Evidence based standard international guidelines should be adapted locally and disseminated to all health care providers who care for the traumatically injured.
- 5) All transfer of substantially injured patients should be accompanied by trained health care providers.
- 6) All vehicles involved with the transfer of injured patients should contain agreed upon basic equipment including pulse oxymetry, suction, oxygen and automated patient monitoring equipment.
- 7) Standardized communication with the receiving trauma facility should be mandated before patient transfer
- 8) Policy makers should recognize the need for integrated trauma care to maximize survivability of an increasing public health threat.
- 9) More robust analytical studies on risk factors determining the condition of the patient on arrival at the hospital where he is to receive definitive treatment should be conducted.

This study suggests that the injured patients are not being transferred in a manner that is consistent with evidence based guidelines which are known to minimize the known hazards of transfer process and consequently improve outcome.

A formally agreed protocol on transport of injured patients incorporating a participant approach between the referring hospital, the ambulance service and the recipient hospital is urgently needed to improve the assessment, resuscitation and safe transfer of injured patients from sites of injury as well as between hospitals, in a manner that minimizes the known hazards of the transfer process.

#### **Limitations:**

The major drawback of this study is that it has been conducted in a single trauma centre and hence the results may not be reflective of India as a whole, where trauma care is in different stages of evolution. Population served by the trauma centre is representative of the population of Uttar Pradesh excluding the districts adjacent to New Delhi and Benaras as patients in these areas prefer to go the tertiary care centres situated there due to physical proximity. However, the results of

the study provide a baseline snapshot of the prevailing interhospital transfer situation in a part of India where trauma care is unorganized.

### **Acknowledgement:**

This study was done as a result of Indian Council Of Medical Research sponsored MD Phd programme being conducted at Chattrapati Sahuji Maharaj Medical University.

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