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## INTER-HOSPITAL TRANSPORT OF THE CRITICALLY ILL AND SEVERE INJURED PATIENT

**Abstract:** There is significant interest in the secondary transport of the critically ill and injured patients. Inter-hospital transfer to a major emergency centers should be initiated soon after arriving at the primary hospital in order to reduce delaying definitive care. Major trauma requiring an inter-hospital transfer can be recognized by: certain vital sign markers; the presence of a specific physiological or anatomical injury; deterioration associated with a high-risk mechanism of injury; or being a high-risk patient. The aim of guidelines and protocols is to guide and support early management and transfer for specific injuries including spinal trauma, burns, traumatic brain injury, obstetric and pediatric trauma. Secondary transport should only occur if it can improve the patient's care and outcome. It should be undertaken in a manner that does not jeopardize the level and quality of care. **Early identification of critical illness or major trauma criteria requiring inter-hospital transfer should be achieved using the defined triage guidelines.**

**Patients with the presence of a high-risk mechanism of injury or a comorbid are at risk of major trauma complications.** Physiological stability during the transfer requires careful pretransfer assessment and optimization of the patient. Good communication between referring and receiving medical staff is very important and have been shown to be effective. Emergency medicine has a key role in the organization of secondary transportation.

**Key words:** secondary transport, critical illness, severe trauma, reasons for transport, triage

There is significant interest in the secondary transport of the critically ill and injured patients. High profile cases entailing the long distance transfer of patients have highlighted the lack of availability of critical care beds and appropriate systems for transferring this patient group. It has been shown that a large number

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of critical care transfers originate in the emergency department. It is imperative that emergency medicine specialists and clinicians have an understanding of the issues surrounding transportation of the critically ill and injured. This should include appreciation of the local and regional organizational frameworks implemented for this patient group<sup>1</sup>.

Inter-hospital transfer to a major emergency centers should be initiated soon after arriving at the primary hospital in order to reduce delaying definitive care. Major trauma patients who receive definitive care in the appropriate medical facility have reduced morbidity and mortality.

Major trauma requiring an inter-hospital transfer can be recognized by: certain vital sign markers; the presence of a specific physiological or anatomical injury; deterioration associated with a high-risk mechanism of injury; or being a high-risk patient<sup>2</sup>. The aim of guidelines and protocols is to guide and support early management and transfer for specific injuries including spinal trauma, burns, traumatic brain injury, obstetric and pediatric trauma. These guidelines have to be developed in collaboration with experts in each of the relevant fields.

The transportation of patients can be divided into a number of specific categories: primary transport (prehospital care) is the transfer of patients from site of illness or injury to first hospital contact. Secondary transport is the transfer of the patient from one to another medical center/hospital for continuing and improving clinical care. Intrahospital transport is the transfer of patients between departments within the same hospital, for example, from the ED to ICU. The hazards and care required during intrahospital transfer are identical to that required for secondary transport<sup>3</sup>.

## ***INDICATIONS FOR TRANSFER***

Secondary transport should only occur if it can improve the patient's care and outcome.<sup>1-3</sup> It should be undertaken in a manner that does not jeopardize the level and quality of care.

## ***ACCOMPANYING STAFF***

In our country, more than 95% of all secondary transports are undertaken by emergency medicine specialists.<sup>3</sup> These medical and nursing staff are appropriately trained and experienced.<sup>3</sup>

The evidence from literature<sup>4</sup> confirming that the quality of care is improved if a transfer team is used. It is however unproven as to whether this is attributable to availability of equipment, increased seniority or training of transport personnel, or better stabilization that the team may perform before transfer.

The role of the team when they are not involved in patient transfer also needs to be defined. The optimal make up of these teams has not been delineated. In general, a senior middle grade doctor from anesthesia or intensive care and at least one senior intensive care nurse in addition to the ambulance staff would constitute the team<sup>3,4</sup>

**Table 1. Reason for transfer<sup>5</sup>**

<b>Reason for transfer</b>	<b>Definition</b>
No critical care facilities	Cottage or private hospital
Investigation	Need for specialist investigational facilities, for example, angiography or referral center diagnostic facilities unavailable
Absence of normal clinical expertise	Normal medical expertise not available at referral site, usually because of medical staff absence, for example, vascular surgeon, neurosurgeon etc.
Specialist facilities	Medical expertise or therapeutic intervention
Repatriation	This can be local, regional, or international. Either because the patient was originally transferred from their local hospital or because they became ill at a remote site
Non-clinical transfer	Current unavailability of an appropriately staffed critical care bed at referring site

### ***Clinical emphasis points***

Early identification of critical illness or major trauma criteria requiring inter-hospital transfer should be achieved using the defined triage guidelines.

### ***Identification of potential major trauma***

Vital signs  
Isolated head injury in older people  
Penetrating injuries  
excluding isolated/superficial limb injuries

### ***Specific injuries***

Limb amputations or limb-threatening injuries, serious crush injury, major compound fracture or open dislocation, two or more of the following fractured: femur/tibia/humerus, pelvis fracture.

## ***Burns***

Burns to more than 20% of the body for an adult or 10% for a child; suspected respiratory tract burns

## ***High-voltage electrical injury***

### **Traumatic Brain Injury**

Neurological deficits, skull fracture, abnormal CT scan findings

## ***Spinal trauma***

Significant spinal fracture, minor spinal cord with nerve injury, presence of neurological deficits

## ***Pediatric trauma***

### **Obstetric trauma**

Evidence of fetal distress and fetus beyond 24 weeks' gestation; possibility of trauma to the uterus<sup>3-6</sup>

## ***High-risk criteria***

Patients with the presence of a high-risk mechanism of injury or a comorbid are at risk of major trauma complications. They should have a complete trauma evaluation conducted and be observed for a period of time. If physiologically stable patients with only a high-risk mechanism of injury or a comorbid factor are triaged as major trauma patients, this may result in unnecessary over-triage. If deterioration in a patient's condition occurs, the situation should be discussed for possible transfer to a highest level of emergency center. High-risk criteria for major trauma involves: ejection from a vehicle, motorbike rider or cyclist impact > 30 km/h, fall from a height > 3 m, struck on the head by an object falling > 3 m, explosion, high-speed car accident (> 60 km/h), pedestrian impact, age < 10 or > 55, pregnancy, significant comorbidity<sup>7</sup>

## ***Influencing factors on choice of transport***

1. The nature of the illness/injury
2. Urgency of transfer
3. Availability of transport

4. Mobilization times
5. Geographical factors
6. Traffic and weather conditions
7. Cost/effectiveness

### ***PRETRANSFER CARE***

All transfers require physiological stability for optimum patient outcome. Physiological stability during the transfer requires careful pretransfer assessment and optimization of the patient. Missed or undertreated injuries<sup>8</sup>, neglected pretransfer respiratory or cardiovascular instability<sup>3,5,8</sup>, and lack of anticipation of potential events<sup>4,6</sup> during the transfer can adversely affect outcome.

Patients who require resuscitation on arrival at the receiving hospital are likely to have a worse outcome and often should not have left the referring hospital without further treatment. Delay in transfer also may be detrimental to certain groups of patients, for example, intracranial haematomas<sup>9</sup> or ruptured abdominal aortic aneurysms.<sup>3-6</sup>

### ***CONSIDERATIONS DURING TRANSPORT***

If appropriate measures have been taken before transfer, there should be little requirement for intervention during transport. Continued reassessment of the patient's clinical status during transfer is mandatory. Vascular access sites should remain accessible during transfer. Ideally, the level of monitoring and the frequency of measurement of physiological parameters should be the same (or similar) as it would be in the resuscitation room

Adverse events should be recorded and action taken to resolve the problem as quickly as possible.

The use of "blue lights" and police escort should be restricted to situations that are completely necessary and not used routinely.

Good communication between referring and receiving medical staff is very important<sup>6,1</sup> and have been shown to be effective. A number of authorities have published pretransfer checklists, en route documentation, and transfer forms. These should include all pertinent clinical details including physiological status.

The receiving hospital should be informed if there is any change in anticipated time of transfers or clinical status. The receiving hospital should be alerted when the patient leaves the referring hospital and 10 minutes before arrival.

The patient and relatives should be kept informed at all times. Relatives should not routinely travel with the patient.

Emergency medicine has a key role in the organization of secondary transportation. Traditionally, critically ill patients have been transported from the referring to receiving hospital in an ad hoc manner. This has resulted in varied clinical practice and standards during the transport process. There should be clear guideline of the level of care given to a critically ill or injured patient during secondary transfer<sup>7-9</sup>.

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