Chapter 12: Stabilization and Transport

Objectives:

Upon completion of this topic, the physician will be able to define and outline general principles for the optimal stabilization and most appropriate transportation of trauma patients.

Specifically, the physician will be able to:

A. Identify those injured patients who may require transfer from a primary care institution to a facility capable of providing the necessary level of trauma care.

B. Outline procedures to optimally stabilize and prepare the trauma patient for safe transport to a higher-level trauma care facility via the appropriate mode of transportation.
I. Introduction

This course is designed to train the students to be more proficient in their ability to assess, stabilize, and prepare the patient for definitive care. If definitive care cannot be rendered at the local hospital, the patient requires transfer to a hospital better suited to his needs. Ideally, this facility should be an appropriately designated trauma center, the level of which depends on the patient’s needs. The decision to transfer the patient to another facility depends on the victim's injuries and the local resources. Decisions as to which patients should be transferred, and when, are matters of medical judgment. Recent evidence supports the view that trauma outcome is enhanced if critically injured patients are care for in facilities prepared for and dedicated to the needs of acutely injured. No longer should the trauma patient be transferred to the closest hospital, but rather to the closest appropriate hospital, preferably a designated trauma center.

The major principle of trauma management is to do no further harm. Indeed, care of the trauma patient should consistently improve with each step, from the scene of the incident to the facility that can provide the patient with the necessary, proper treatment. All those who care for trauma patients must ensure that the level of care never declines from one step to another.

II. Determining the Need for Patient Transfer

The vast majority of patients receive their total care in the local hospital, and movement beyond that point is not necessary. It is essential that physicians assess their own capabilities and limitations, and those of their institution. This allows for early recognition of patients who may be safely cared for in the local hospital, and those who require transfer to an institution that can provide optimal care. Once the need for transfer is recognized, arrangements should be expedited and not delayed for diagnostic procedures (eg, peritoneal lavage, computed tomographic scan) that do not change the immediate plan of care.

Patient outcome is directly related to time from injury to properly delivered definitive care. In those institutions in which there is no full-time, in-house emergency department coverage, the timeliness of transfer is partly dependent on the response of the physician to the emergency department. Consequently, it is recommended that appropriate communication with the prehospital system be developed such that those patients can be identified who require the presence of a physician in the emergency department at the time of arrival. Subsequently, the attending physician should be committed to respond to the emergency department prior to the arrival of these critically injured patients. Identification of those patients requiring prompt attention can be based on physiologic measurements, specific identifiable injuries, and mechanism of injury.

The timing of interhospital transfer varies based on the distance of transfer, the available skill levels for transfer, circumstances of the local institution, and intervention that is necessary before the patient can be transferred safely. Life-threatening injuries that can be stabilized, operatively or nonoperatively, at the primary care facility must be treated prior to transport. This treatment may require operative intervention to ensure that the patient is in the best possible condition for transfer. Intervention prior to transfer is a surgical decision.
To help the physician determine which patients might need care at a higher-level facility, the ACS Committee on Trauma recommends using certain physiologic indices, injury mechanisms and patterns, and historical information. These factors also help the physician decide which stable patients might benefit from transfer.

Certain clinical measurements of physiologic status are useful in determining the need for transfer to an institution that provides a higher level of care. Patients who exhibit evidence of shock, significant deterioration, or progressive deterioration in neurologic status require the highest level of care and should benefit from timely transfer.

Patients with certain specific injuries, combination of injuries (particularly those involving the brain), or who have historical findings indicating a high-energy transfer may be at risk for death and are candidates for early transfer to a trauma center. Criteria suggesting the necessity for early transfer are outlined in Table 1, Interhospital Triage Criteria.

Alcohol and/or other drug abuse are common to all forms of trauma and are particularly important to identify. Physicians should recognize that alcohol and drugs can alter pain perception and mask significant physical findings. Alterations in the patient's responsiveness may be related to alcohol and drugs, but absence of cerebral injury should never be assumed in the presence of alcohol or drugs. If the examining physician is unsure, transfer to a higher-level facility may be appropriate. Death of another individual involved in the incident suggests the possibility of severe, occult injury in survivors. A thorough and careful evaluation of the patient, even in the absence of obvious signs of severe injury, is mandatory.

III. Transfer Responsibilities

A. Referring Physician

The referring physician is responsible for the initiation of transfer of the patient to the receiving institution and for the selection of an appropriate mode of transportation and level of care required for optimal management of the patient en route. The referring physician should consult with the receiving physician and should be thoroughly familiar with the transporting agencies, their capabilities, and with the arrangements for patient management during transport.

The referring physician is responsible for stabilizing the patient's condition, within the capabilities of the initial institution, before the patient is actually transferred to another facility. Initiation of the transfer process should begin while resuscitation efforts are in progress.

Transfer agreements must be established to provide for the consistency and efficient movement of patients between institutions. These agreements allow for feedback to the referring hospital and enhance the efficiency and quality of the patient's management during transfer. (See Resource Document 9, Transfer Agreement.)
Table 1. Interhospital Triage Criteria

**Central Nervous System**
- Head injury - Penetrating injury or depressed skull fracture.
- Open injury with or without CSF leak.
- GCS score < 14 or GCS deterioration.
  
  Spinal cord injury.

**Chest**
- Widened mediastinum.
- Major chest wall injury.
- Cardiac injury.
- Patients who may require protracted ventilation.

**Pelvis**
- Unstable pelvic-ring disruption.
- Pelvic-ring disruption with shock and evidence of continuing hemorrhage.
- Open pelvic injury.

**Multisystem Injury**
- Severe face injury with head injury.
- Chest injury with head injury.
- Abdominal or pelvic injury with head injury.
- Major burns or burns with associated injuries, (see Transfer Criteria in Chapter 9, Injury Due to Burn and Cold).
- Multiple fractures.

**Evidence of High-energy Impact**
- Auto crash or pedestrian injury - velocity ≥ 25 mph.
- Rearward displacement of front axle or front of car (20 inches or 50 cm).
- Ejection of patient or rollover.
- Death of occupant in same care.

**Comorbid Factors**
- Age < 5 years or > 55 years.
- Known cardiorespiratory or metabolic diseases.

**Secondary deterioration (Late Sequelae)**
- Mechanical ventilation required.
  
  Sepsis.
  
  Single or multiple organ system failure (deterioration in central nervous, cardiac, pulmonary, hepatic, renal, or coagulation systems).
  
  Major tissue necrosis.
B. Receiving Physician

The receiving physician must be consulted with regards to the transfer of a trauma patient to his institution. The receiving physician must assure that his institution is qualified, able and willing to accept the patient, and is in agreement with the intent to transfer. The receiving physician may assist the referring physician in arrangements for the appropriate mode and level of care during transport.

The quality of care rendered en route also is of vital importance to the patient's outcome. Only by direct communication between the referring and receiving physicians can the details of patient transfer be clearly delineated. If adequately trained ambulance personnel are not available, a nurse or physician should accompany the patient. All monitoring and management rendered en route should be documented.

IV. Modes of Transportation

The principle of "Do No Further Harm" is the most important principle when choosing the mode of patient transportation. Ground and air transportation modalities can be safe and effective in fulfilling this principle.

Keys to successful patient transport are the availability of appropriately trained personnel and proper equipment to manage problems specific to the patient's condition, whether transportation is by ground or air. The choice of transport mode is based on the availability of these personnel, and which mode provides the safest and most rapid method of transportation. Weather considerations are crucial in this decision-making process.

V. Transfer Protocols

Where protocols for patient transfer do not exist, the following guidelines are suggested.

A. Referring Physician

The local physician wishing to transfer the patient should speak directly to the physician accepting the patient at the receiving hospital and provide this information:

1. Identification of the patient.
2. A brief history of the incident, including pertinent prehospital data.
3. Initial patient findings in the emergency department, and the patient's response to the therapy administered.
B. Information to Transferring Personnel

Information regarding the patient's condition and needs during transfer should be communicated to the transporting personnel. This information should include, but not be limited to:

1. Airway maintenance.
2. Fluid volume replacement.
3. Special procedures that may be necessary.
4. Revised Trauma Score, resuscitation procedures, and any changes that may occur en route.

C. Documentation

A written record of the problem, treatment given, and patient status at the time of transfer, as well as certain physical items, must accompany the patient. These should include:

1. Initial diagnostic impression.
2. Patient's name, address, hospital number, age; and name, address, and phone number of next of kin.
3. History of injury or illness.
4. Condition at the time of admission to the hospital.
5. Vital signs prehospital, during stay in emergency department, and at time of transfer.
6. Treatment rendered, including medications given and route of administration.
7. Laboratory and roentgenographic findings, appropriate laboratory specimens (eg, lavage), and all roentgenograms.
8. Fluids given by type and volume.
9. Name, address, and phone number of the referring physician.
10. Name of physician at the receiving institution who has been contacted about the patient.
D. Prior to Transfer

The patient should be resuscitated and attempts made to stabilize his or her condition as completely as possible based on this suggested outline.

1. Respiratory
   a. Insert an airway or endotracheal tube, if needed.
   b. Determine rate and method of administration of oxygen.
   c. Provide suction.
   d. Provide mechanical ventilation when needed.
   e. Insert a chest tube if needed.
   f. Insert a nasogastric tube to prevent aspiration.

2. Cardiovascular
   a. Control external bleeding.
   b. Establish two large-caliber IVs and begin crystalloid solution infusion.
   c. Restore blood volume losses with crystalloid or blood, and continue replacement during transfer.
   d. Insert an indwelling catheter to monitor urinary output.
   e. Monitor the patient's cardiac rhythm and rate.

3. Central nervous system
   a. Maintain controlled hyperventilation for head-injured patients after neurosurgical consultation.
   b. Administer mannitol or diuretics, if needed, after neurosurgical consultation.
   c. Immobilize head, neck, thoracic, and/or lumbar spine injuries.
4. Diagnostic studies
   a. Roentgenograms of cervical spine, chest, pelvis, and if indicated, extremities.
   b. Hemoglobin, hematocrit, type and crossmatch, arterial blood gas determinations, and pregnancy test on all females of childbearing age.
   c. Blood alcohol and/or other drugs as indicated.
   d. Electrocardiogram.
   e. Urinalysis (include drug screen as indicated).

5. Wounds
   a. Clean and dress.
   b. Tetanus toxoid.
   c. Tetanus Immune Globulin, if indicated.
   d. Antibiotics, when indicated.


E. Management During Transport
   1. Continued support of cardiorespiratory system.
   2. Continued blood volume replacement.
   3. Monitoring of vital signs.
   4. Use of appropriate medications as ordered by a physician or as provided by written protocol.
   5. Maintenance of communication with a physician or institution during the transfer.
   6. Maintenance of accurate records during transfer.
VI. Transfer Data

The information accompanying the patient should include both demographic and historical information pertinent to the patient's injury. Uniform transmission of information is enhanced by the use of an established transfer form. Examples of appropriate data to include on a transfer form are outlined on Chart 1, Transfer Form, at the conclusion of this chapter. Other data that should accompany the patient are outlined on Chart 2, Revised Trauma Score (this chapter), and the Pediatric Trauma Score (Resource Document 7). In addition to the information already outlined, space should be provided for recording data in an organized, sequential fashion - vital signs, CNS function, and urinary output - during the initial resuscitation and transport period. (See Resource Document 8, Trauma Flow Sheet.)
Chart 1. Sample Transfer Form

(Suggested Information to Send With The Patient)

A. Patient’s Name:

Address:
Address:
Age: Sex: Weight:

Next of Kin:
Address:
Address:
Phone Number:
Religion:

B. Time

Of Injury:
Admitted to ED:
Admitted to OR:
Transfer:

C. History of Current Injury:

Mechanism of Injury:
AMPLE History:

D. Condition on Admission:

Pulse: Respiratory Rate:
Blood Pressure: Rhythm:
Temperature:

E. Initial Diagnostic Impressions:

F. Diagnostic Studies:

1. Laboratory Data - Attach all results to form

2. Basic Radiographic Studies - Send films with patient

3. Electrocardiogram

4. Send appropriate specimens, eg, peritoneal lavage fluid
G. Treatment Rendered:
   1. Medications: Amount and Time
   2. IV Fluids: Type and Amount
   3. Other:

H. Status of Patient When Transferred:

I. Management During Transport:

J. Referring Physician:
   Referring Hospital:
   Phone Number:

K. Receiving Physician:
   Receiving Hospital:

L. Consent Form:
Chart 2. Revised Trauma Score

(Adherence to these guidelines is thought to enhance interhospital transfer.)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Score</th>
<th>Start of Transport</th>
<th>End of Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Respiratory Rate, Breaths/minute</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-24</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-35</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 36</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-9</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>B. Systolic Blood Pressure, mm Hg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 89</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-89</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-69</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-49</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>C. Glasgow Coma Scale Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-15</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-12</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C = D + E + F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>D. Eye Opening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To voice</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>E. Verbal Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oriented</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomprehensible words</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>F. Motor Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obey command</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Localizes pain</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdraw (pain)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion (pain)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension (pain)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Glasgow Coma Score (Total D + E + F)</td>
<td>. .</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revised Trauma Score = A + B + C</td>
<td>. .</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VII. Summary

A. The major principle of trauma management is to do no further harm.

B. The treating physician should know his own capabilities and his institution's capabilities, and the indications for transfer.

C. The referring physician and receiving physician should communicate directly.

D. Transfer personnel should be adequately skilled to administer the required patient care en route.