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**CHAPTER 4**

**TRAUMA TREATMENT PROTOCOLS**

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## **MULTIPLE TRAUMA OVERVIEW**

### **Specific information needed**

- A. Mechanism of injury
  - 1. Cause, precipitating factors, weapons.
  - 2. Trajectories and forces involved to patient.
  - 3. Vehicular trauma – condition of vehicle, windshield, steering wheel, use of seatbelts.
  - 4. Helmet use if motorcycle or bicycle.
- B. Patient complaints.
- C. Initial position and level of consciousness of patient from witnesses, first responders.
- D. Patient movement, treatment since injury.
- E. Other factors such as drugs, medications, diseases.

### **Specific objective findings**

- A. Scene evaluation
  - 1. Note potential hazard to rescuers and patient.
  - 2. Identify number of patients. Organize triage if appropriate.
  - 3. Observe position of patient, surroundings, probable mechanism, and vehicle condition.
- B. Patient evaluation – initial assessment in a multiple trauma patients is performed at the same time as treatment.

### **Initial assessment and treatment**

- A. Evaluate scene. Make area safe for rescuers and patient; call for back-up as needed.
- B. Airway
  - 1. Open airway using jaw thrust maneuver, keeping neck in neutral alignment.
  - 2. Use assistant to provide cervical stabilization while managing ABCs.
  - 3. Clear the airway using finger sweep, suction as needed.
  - 4. Use towel clip or hand to draw tongue and mandible forward if needed in patients with facial injuries.
- C. Breathing
  - 1. Treat respiratory arrest with
    - a. Bag-valve-mask for initial ventilatory control.
    - b. CPR as needed.
    - c. Intubate (prefer orotracheal) with cervical stabilization after initial ventilation as above. Confirm position of the tube, ventilate and monitor during transport.
    - d. If difficulty with intubation, consider Dual-lumen airway.
    - e. If none of the above are effective due to severe facial injury or other factors, perform cricothyrotomy. Confirm position of the tube, ventilate and monitor.
  - 2. Look for signs of partial obstruction – noisy breathing, exaggerated chest wall movements. If present
    - a. Suction and clear manually.
    - b. Reposition jaw while protecting neck.

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- c. Insert oral or nasal airway as needed.
    3. If respiratory rate < 12/minute, > 20/minute or breathing appears inadequate
      - a. Apply O<sub>2</sub>, support with bag-valve-mask.
      - b. Consider intubation – nasotracheal or orotracheal with firm cervical stabilization to secure airway.
        - c. Confirm position of the tube, ventilate and monitor.
        - d. If difficulty with intubation, consider RSI or dual-lumen airway.
    4. Inspect chest for symmetrical rise, sucking wounds, flail segment. If indicated
      - a. Stabilize flail and cover sucking wounds. (See Chest Injury Protocol.)
      - b. If ventilations, which were initially effortless, become difficult after bagging, consider tension pneumothorax decompression.
      - c. Apply O<sub>2</sub>, moderate flow (4-6 L/min), by mask or nasal cannula (high flow with mask for critical patients). Titrate to pulse oximetry > 90% if possible.
- D. Circulation
1. Control hemorrhage with direct pressure, and tourniquet as needed.
  2. Check radial pulse – presence implies BP > 80 mm Hg systolic. If not present, check carotid or femoral pulse (presence implies BP > 60-70 mm Hg systolic).
  3. Check pulse for quality (strong, weak), general rate (slow, fast, moderate).
  4. Check skin color, temperature, and capillary refill.
  5. Initiate CPR and transport if no pulses are present, but initial vital signs detected, unless multiple casualty scene or prolonged transport make resuscitation impossible.
- E. Disability
1. Check level of consciousness, briefly, for essential elements – AVPU.  
 A – Alert  
 V – Responds to Verbal stimuli  
 P – Responds to Painful stimuli  
 U – Unconscious
  2. Check pupils – round? reactive? equal?
- F. Obtain vital signs if patient stable or adequately resuscitated.
- G. Immobilize cervical spine when appropriate (relieve assistant performing manual stabilization).
- H. Transfer patient to board.
- I. EXTRICATE AND TRANSPORT RAPIDLY if patient has multiple injuries or abnormal respiratory, circulatory or neurologic status.
- J. Treat hypovolemic shock enroute
1. Elevate legs, keep patient warm.
  2. IV – volume expander (NS or RL), large bore, two sites
    - a. TKO if patient appears stable and systolic BP > 90.
    - b. Wide open if significant signs of shock, 20 ml/kg.
  3. Stabilize and splint fractures.
  4. Dress wounds if time allows.

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- K. If patient stable
  - 1. Perform secondary survey and full neurologic exam. Record list of patient's problems.
  - 2. With significant injury or potential for hypovolemia, start IV – volume expander (NS or RL), large bore, one or two sites, TKO.
  - 3. Stabilize and splint fractures.
  - 4. Dress wounds if possible.
  - 5. Reassess and treat patient for life-threats
    - a. Adequacy of airway, breathing.
    - b. Emergent chest injuries
      - 1. Flail section.
      - 2. Tension pneumothorax.
      - 3. Cardiac tamponade.
      - 4. Sucking chest wound.
    - c. Monitor closely for signs of hypovolemia.
- L. Recheck vital signs, neurologic status, and monitor cardiac rhythm enroute.

**Specific precautions**

- A. Although the organization of assessment and management may seem complex, remember the basic principles to keep organized.
  - 1. As with any critical patient, assess and manage life-threatening impairment of
    - a. Airway
    - b. Breathing
    - c. Circulation
  - 2. If patient unstable, transport urgently (LOAD AND GO).
  - 3. If the patient is stable, assess for potentially life-threatening injuries (detailed exam) and manage them.
- B. Serial vital signs and observations of neurologic status in the field are critical. Use a flow chart to help organize information and observe if patient is improving or deteriorating.
- C. Direct pressure will control most external hemorrhage. Continued direct hand pressure during transport may be required. Use a commercial tourniquet as needed.
- D. Even in the noncritical patient with significant injury, "stabilization in the field" does not occur. With major injuries, the very most that can be done is to buy time. If the initial bolus of fluids resulted in improved vitals, do not become complacent. This patient frequently needs blood and an operating room to truly "stabilize" the traumatic process. Rapid transport is still of the highest priority.
- E. Recent literature has questioned the value of rapid fluid infusion for patients with ongoing internal bleeding. There is at least some evidence that internal bleeding may be increased with the administration of fluids. The final answer is not available, but it may be prudent to consider maintaining the IVs at TKO if the patient is not in profound shock. The establishment of one or two IVs will remain a priority. It is important to have the lines available should the patient deteriorate or for the rapid administration of fluids and blood in the operating room after the bleeding has been controlled. The earlier those vessels are cannulated the greater the success rate.

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## ABDOMINAL TRAUMA

### Specific information needed

- A. Patient complaints.
- B. For penetrating trauma – weapon, trajectory.
- C. For auto – condition of vehicle, steering wheel, dash – air bags deployed, speed, patient trajectory, seatbelts in use (type – lap/shoulder).
- D. Past history – medical problems, medications.

### Specific objective findings

- A. Observe – distention, bruising, entrance/exit wounds.
- B. Palpate – areas of tenderness, guarding, pelvis stability to lateral and suprapubic compression.
- C. Condition of vehicle and steering wheel.

### Treatment

- A. Stabilize life-threatening airway, breathing and circulatory problems first. Obtain vital signs.
- B. IV – volume expander (NS or RL), large bore, TKO if patient stable.
- C. For penetrating injuries – cover wounds and evisceration with moist saline gauze to prevent further contamination and drying. Do not attempt to replace.
- D. Observe carefully for signs of blood loss. If BP < 90 systolic or significant signs of shock
  - 1. Second IV, large bore, volume expander, if possible.
  - 2. Administer fluid bolus, 20 ml/kg, and further fluids as directed.
- E. Monitor vital signs during transport.

### Specific precautions

- A. The extent of abdominal injury is difficult to assess in the field. Be very suspicious; with significant blunt trauma, injuries to multiple organs are the rule.
- B. Patients with spinal cord injury or altered sensorium due to drugs, alcohol, or head injury may not complain of tenderness and may lack guarding in the presence of significant intra-abdominal injury.

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## **AMPUTATION**

### **Specific information needed**

- A. History – time and mechanism of amputation, care for severed part prior to rescuer arrival.
- B. Past history – medical conditions, bleeding tendencies, meds.

### **Specific objective findings**

- A. Vital signs. Other injuries. Blood loss at scene.
- B. Structural attachments in partial amputations if identifiable.

### **Treatment**

- A. Control hemorrhage with direct pressure, and tourniquet as needed.
- B. Resuscitate and treat airway, breathing, and circulatory problems.
- C. If significant hypotension: IV – volume expander (NS or RL), 20 ml/kg, then TKO or as directed.
- D. Patient – gently cover stump with sterile dressing. Saturate with sterile saline. Cover with dry dressing.
- E. Severed part – Wrap in sterile gauze. Moisten with sterile saline. Place in water-tight container in cooler with ice (do not freeze).
- F. Consult base for instruction on optimum transport destination.

### **Specific precautions**

- A. Partial amputations should be dressed and splinted in alignment with extremity to ensure optimum blood flow. Avoid torsion in handling and splinting.
- B. Do not use dry ice to preserve severed part.
- C. Control all bleeding by direct pressure only to preserve tissues. The most profuse bleeders may occur in partial amputations, where cut vessel ends cannot retract to stop bleeding. Never clamp bleeding vessels with hemostats.
- D. Many factors enter into the decision to attempt reimplantation (age, location, condition of tissues, etc). Treatment decisions cannot be made until the patient and part have been examined by the specialist – and may not be made at the primary care hospital. Try to help the family and patient understand this and do not falsely elevate hopes.

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## CHEST INJURY

### Specific information needed

- A. Patient complaints – chest pain (type), respiratory distress, neck pain, other areas of injury.
- B. Mechanism – amount of force involved, particularly deceleration, speed of impact, seatbelt use, and type.
- C. Penetrating trauma – size of object, caliber of bullet.
- D. Past medical history – medications, medical problems.

### Specific objective findings

- A. Observe – wounds, air leaks, chest movement, neck veins.
- B. Palpate – tenderness, crepitus, tracheal position, tenderness on sternal compression, pulse pressure.
- C. Auscultate – breath sounds, heart sounds (quality).
- D. Surroundings – weapons, vehicle, steering wheel condition.

### Treatment

- A. Clear and open airway. Stabilize neck.
- B. Assist breathing if patient is apneic or respirations depressed.
- C. Apply O<sub>2</sub>, high flow (10-15 L/min) by mask. Titrate to pulse oximetry > 90% if possible.
- D. Control exsanguinating hemorrhage with direct pressure.
- E. If penetrating injury present, transport rapidly with further stabilization enroute.
- F. For open chest wound with air leak, use Vaseline-type gauze occlusive dressing, plastic wrap or aluminum foil taped on three sides only, to allow air to escape but not enter the chest.
- G. Observe chest for paradoxical movements. Treat lateral flail segment by splinting with sandbags or bags of IV fluid. Use hand pressure to sternum or other areas of the chest to minimize abnormal movement. If chest cannot be adequately stabilized by those means, consider intubation and positive pressure ventilation.
- H. IV – volume expander (NS or RL), large bore, TKO.
- I. Obtain baseline vital signs, neurologic assessment.
- J. Evaluate neck veins and blood pressure
  1. If neck veins flat and patient's BP < 90, transport rapidly and treat hypovolemia enroute
    - a. Consider fluid bolus of 20 ml/kg, further fluids as directed.
    - b. Monitor cardiac rhythm.
  2. If patient BP < 90, neck veins distended, also transport rapidly, and consider
    - a. Tension pneumothorax if respiratory status markedly deteriorating with clinical findings of pneumothorax
      1. Release dressings on open chest wounds.
      2. Consider needle decompression.

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- b. Pericardial tamponade if mechanism of injury suspicious (may have distant heart sounds and narrow pulse pressure)
      - 1. Consider fluid bolus of 20 ml/kg.
    - c. Cardiac contusion with typical ischemic chest pain or severe chest wall contusion
      - 1. Monitor cardiac rhythm.
      - 2. Consider cautious fluid bolus of 10 ml/kg enroute or as directed.
      - 3. Lidocaine, 1 mg/kg, IV for significant PVCs.
  - 3. If BP > 90
    - a. Complete detailed exam.
    - b. If significant injury present
      - 1. Second IV, volume expander (NS or RL), large bore, TKO.
      - 2. Monitor cardiac rhythm enroute.
      - 3. Lidocaine, 1 mg/kg, IV for significant PVCs.
    - c. Bandage and splint if appropriate.
- K. Immobilize impaled objects in place with dressings to prevent movement. If necessary transport sitting up or prone.
- L. Monitor vitals and level of consciousness every five minutes.

**Specific precautions**

- A. Chest trauma is treated with difficulty in the field and prolonged treatment before transport is NOT indicated. If patient is critical, transport rapidly and avoid treatment of non emergent problems at the scene. Penetrating injury particularly should receive immediate transport with minimal intervention in the field.
- B. Consider medical causes of respiratory distress such as asthma, pulmonary edema or COPD that have either caused trauma or been aggravated by it. Consider MI in single car crash.
- C. Chest injuries sufficient to cause respiratory distress are commonly associated with significant blood loss. Look for hypovolemia.

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## **EXTREMITY INJURIES**

### **Specific information needed**

- A. Mechanism of injury, direction of forces, if known.
- B. Areas of pain or limited movement.
- C. Treatment prior to arrival – reduction of open or closed fracture, movement of patient.
- D. Past medical history – medications, medical illnesses.

### **Specific objective findings**

- A. Vital signs.
- B. Observe – localized swelling, discoloration, angulation, lacerations, exposed bone fragments, loss of function, guarding.
- C. Palpate – tenderness, crepitus, instability, quality of distal pulses, sensation.
- D. Note estimated blood loss at scene.

### **Treatment**

- A. Treat airway, breathing, and circulation as first priorities.
- B. Immobilize cervical spine when appropriate.
- C. Examine for additional injuries to head, face, chest, and abdomen. Treat problems with higher priority first.
- D. If patient unstable, transport rapidly, treating life-threatening problems enroute. Splint patient by securing to long board to minimize fracture movement.
- E. If patient stable, or isolated extremity injury exists
  - 1. Check distal pulses and sensation prior to immobilization of injured extremity.
  - 2. Apply sterile dressing to open fractures. Note carefully wounds that appear to communicate with bone, and initial position of bone in wound.
  - 3. Splint areas of tenderness or deformity – apply gentle traction throughout treatment and try to immobilize the joint above and below the injury in the splint.
  - 4. Reduce fractures (including open fractures) by applying gentle axial traction if indicated
    - a. To restore circulation distally.
    - b. To immobilize adequately.
  - 5. Check distal pulses and sensation after reduction and splinting.
  - 6. Elevate simple extremity injuries. Apply padded ice if time and extent of injuries allow.
  - 7. Monitor circulation (pulse and skin temperature), sensation, and motor function distal to the site of injury during transport.
  - 8. Consider pelvic wrap/sling for stabilization of pelvic fractures.
  - 9. Provide pain control for pain unresponsive to splinting or to assist with splint.

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### **Special precautions**

- A. Patients with multiple injuries have a limited capacity to recognize areas which have been injured. A patient with a femur fracture may be unable to recognize that he has other areas of pain. Be particularly aware of injuries proximal to the obvious ones (e.g., a hip dislocation with a femur fracture, or a humerus fracture with a forearm fracture).
- B. Do not use ice or cold packs directly on skin or under air splints, pad with towels or leave cooling for hospital setting.
- C. Do not attempt to reduce dislocations in the field. The only reasonable exception is a dislocated patella – if the diagnosis is clear and transport time is greater than 5 minutes – reduce dislocation by gently straightening the leg (after pain medication, if possible). Splint all dislocations in the position of comfort.
- D. Fractures do not necessarily lead to loss of function. Impacted fractures may cause pain but little or no loss of function.
- E. Do not allow severely angulated, open, bloody fractures to distract you from a less obvious pneumothorax with respiratory distress. Extremity injuries benefit from appropriate care, but are of low priority in a multiple-injured patient. Quick stabilization with a long board and generous taping is ample for the seriously injured patient.
- F. Fractures near joints may become more painful and circulation may be lost with attempted reduction. If this occurs, stabilize the limb in the position of most comfort and with the best distal circulation.

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## FACE AND NECK TRAUMA

### Specific information needed

- A. Mechanism of injury – impact of steering wheel, windshield, or other objects. Clothesline-type injury to face or neck.
- B. Management before arrival by bystanders, first responders.
- C. Patient complaints – areas of pain, trouble with vision, hearing, neck pain, abnormal bite.
- D. Past medical history – medications, medical illnesses.

### Specific objective findings

- A. Vital signs.
- B. Airway – jaw or tongue instability, loose teeth, vomitus or blood in airway, other evidence of impairment or obstruction.
- C. Neck – tenderness, crepitus, hoarseness, bruising, and swelling.
- D. Blood or drainage from ears, nose.
- E. Level of consciousness, evidence of head trauma.
- F. Injury to eyes, lid laceration, blood anterior to pupil, abnormal pupil, abnormal globe position or softness.

### Treatment

- A. Control airway
  - 1. Open airway using jaw thrust, keeping neck in alignment with manual stabilization.
  - 2. Use finger sweep to remove teeth or debris.
  - 3. Suction blood and other debris, as able.
  - 4. Stabilize tongue and mandible with chin lift, manual traction or towel clip to tongue to keep posterior pharynx open as needed.
  - 5. Note evidence of laryngeal injury and transport immediately if signs present.
  - 6. With isolated facial injury, place patient prone or sitting up and leaning forward to ensure airway as needed.
  - 7. Intubate if bleeding severe or airway cannot be maintained otherwise. Avoid nasotracheal intubation with mid-face trauma. If using orotracheal approach, ensure cervical stabilization to prevent neck extension. Confirm tube position immediately after intubation.
  - 8. If intubation cannot be performed due to severe facial injury, attempt to manage with suctioning and supportive care. Consider RSI or alternative airways.
  - 9. If necessary, consider cricothyrotomy. Confirm tube position immediately after procedure.
- B. Support breathing as needed. If mask fit cannot be maintained because of trauma, consider intubation or cricothyrotomy.
- C. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90%.
- D. Stop hemorrhage. Check pulse and circulation.
- E. IV – volume expander (NS or RL), large bore
  - 1. TKO if stable.
  - 2. With signs of shock, administer 20 ml/kg fluid bolus, further fluids as directed.
- F. Immobilize cervical spine (relieve assistant performing cervical stabilization).

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- G. Obtain vital signs, assess neurologic status.
- H. Complete secondary survey if no life-threatening injuries present.
- I. Cover injured eyes with protective shield or cup – avoid pressure or direct contact to eye.
- J. Do not attempt to stop free drainage from ears, nose. Cover lightly with dressing to avoid contamination.
- K. Transport avulsed teeth with the patient. Keep moist in saline-soaked gauze.
- L. If airway secured and patient stable, splint fractures and manage non-emergent injuries at scene or enroute.
- M. Monitor airway closely during transport for development of obstruction or respiratory distress. Suction and treat as needed.

**Specific precautions**

- A. Fracture of the larynx should be suspected in patients with respiratory distress, abnormal voice, and history of direct blow to neck from steering wheel, rope, fence, wire, etc. Both intubation and needle cricothyrotomy may be unsuccessful in the patient with a fractured larynx and attempts may precipitate respiratory arrest. Transport rapidly for definitive treatment, if you suspect this potentially lethal injury. Do not attempt intubation or cricothyrotomy unless the patient arrests.
- B. Airway obstruction is the primary cause of death in persons sustaining head and face trauma. Meticulous attention to suctioning, and stabilization of tongue and mandible may be the most important treatment rendered.
- C. Do not be concerned with contact lens removal in the field. The safest place for lenses is in the eye.
- D. In penetrating neck trauma, avoid intubation unless absolutely essential.

## HEAD TRAUMA

### Specific information needed

- A. History – mechanism of injury, estimate of force involved, helmet worn with motorcycle or bicycle.
- B. History since injury – loss of consciousness (duration), change in level of consciousness, memory loss for events before and after trauma, movement (spontaneous or performed by bystanders).
- C. Past history – medications (insulin particularly), medical problems, seizure history.

### Specific objective findings

- A. Vital signs (note respiratory pattern and rate).
- B. Neurologic assessment, including pupils, response to stimuli and Glasgow Coma Scale observations.

	Adult	Revised Pediatric	
Eye Opening	None	None	1
	To pain	To pain	2
	To Speech	To Speech	3
	Spontaneously	Spontaneously	4
Best Verbal Response	None	None	1
	Garbled sounds	Inconsolable, agitated	2
	Inappropriate words	Inconsistently inconsolable, moaning	3
	Disoriented sentences	Cries but consolable, inappropriate interactions	4
	Oriented	Smiles, orientated to sounds, follows objects, interacts	5
Best motor response	None	None	1
	Abnormal extension	Decerebrate Posturing	2
	Abnormal flexion	Decorticate Posturing	3
	Withdrawal to pain	Withdrawal to pain	4
	Localizes pain	Withdraws from touch	5
	Obeys commands	Moves spontaneously or purposefully	6

GLASGOW COMA SCORE = Sum of scores in 3 categories(15 points possible)

- C. External evidence of trauma – contusions, abrasions, lacerations, bleeding from nose, ears.

### Treatment

- A. Assess airway and breathing. Treat life-threatening difficulties (see Trauma Overview). Use assistant to provide cervical stabilization while managing respiratory difficulty.
- B. Control hemorrhage. Stop scalp bleeding with direct pressure if possible. Continued pressure may be needed.

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- C. Apply O2, moderate flow (4-6 L/min), by mask or nasal cannula (high flow by mask for seriously injured patients). Titrate to pulse oximetry > 90% if possible.
- D. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- E. If unconscious, or Glasgow Coma Score < 11
  - 1. Assist ventilations.
  - 2. Consider intubation. If time allows administer lidocaine, 1.5 mg/kg IV, 1 minute prior to intubation.
  - 3. Ventilate at 12 - 16 breaths per minute. If capnography is available, ventilate to maintain end tidal CO2 of 32-38.
  - 4. Consider RSI.
- F. Immobilize cervical spine (relieve assistant performing manual stabilization).
- G. Immobilize patient on spine board.
- H. Secure patient to board following transfer. Be prepared to tilt for vomiting.
- I. TRANSPORT RAPIDLY if patient has multiple injuries, or unstable respiratory, circulatory, or neurologic status.
- J. If signs of hypovolemic shock are present, initiate treatment enroute.
  - 1. Elevate legs, keep patient warm.
  - 2. IV – volume expander (NS or RL), large bore to maintain systolic blood pressure >120 in an attempt to maintain cerebral pressure.
  - 3. Consider bleeding sources (abdomen, pelvis, and chest).
  - 4. Stabilize and splint fractures, dress wounds if time allows.
- K. If patient unconscious and showing signs of neurological deterioration (e.g., dilated pupil, rising BP, slowing pulse, posturing or decreasing GCS)
  - 1. Hyperventilate at 20-24 breaths per minute. If capnography is available, ventilate to maintain end tidal CO2 of 30-35.
  - 2. Consider furosemide, 20-40 mg IV.
- L. If patient stable (respiratory, circulatory, neurologically)
  - 1. IV – volume expander (NS or RL), large bore, TKO.
  - 2. Complete secondary survey.
  - 3. Splint fractures and dress wounds if time permits.
- M. Monitor airway, vitals, and level of consciousness repeatedly at scene and during transport. STATUS CHANGES ARE IMPORTANT.

### **Specific precautions**

- A. When head injury patients deteriorate, check first for airway, oxygenation and blood pressure. These are the most common causes of "neurologic" deterioration. If the patient has tachycardia or hypotension, look for hidden hypovolemia from associated injuries and do not blame the head injury.
- B. The most important information you provide for the base physician is level of consciousness and its changes. Is the patient stable, deteriorating or improving?
- C. Assume cervical spine injury in all patients with head trauma.
- D. Restlessness can be a sign of hypoxia. Cerebral anoxia is the most frequent cause of death in head injury.
- E. If active airway ventilation is needed, intubate and hyperventilate at 20-24/minute. If capnography is available ventilate to maintain end tidal CO2 of 30-35. **Hypoventilation and excessive hyperventilation both compromise cerebral perfusion**

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- F. If patient is combative from head injury or hypoxia, consider use of morphine sulfate 2-4 mg IV or fentanyl 25-50 mcg IV, repeated x 1 as needed to reduce combativeness. Additionally, diazepam can be utilized to decrease combative state. The airway and C-spine can be more appropriately managed with a relaxed patient and the effects can be reversed at the receiving facility if desired. Administer cautiously (SLOWLY) in hypovolemic patient.
- G. Do not try to stop bleeding from nose and ears. Cover with clean gauze if needed to prevent further contamination.
- H. Scalp lacerations can cause profuse bleeding, and are difficult to define and control in the field. If direct local pressure is insufficient to control bleeding, evacuate any large clots from flaps and large lacerations with sterile gauze and use direct hand pressure to provide hemostasis. If the underlying skull is unstable, pressure should be applied to the periphery of the laceration over intact bone.
- I. Control seizure activity with benzodiazepine per protocol.

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## **SHOCK: TRAUMATIC**

### **Specific information needed**

- A. Mechanism of injury – position, forces, speed, trajectory.
- B. Patient complaints – thirst, dizziness, weakness, chest pain, trouble breathing.
- C. Car – steering wheel and vehicle condition, seatbelt use and type.
- D. Past medical history – medications, medical illnesses.

### **Specific objective findings**

- A. Vital signs – pulse > 120 (bradycardia or normal pulse rate may occur in some patients), BP < 90 systolic.
- B. Mental status – mania or apathy, confusion, restlessness.
- C. Skin – flushed, constricted, sweaty, cool or warm, color.
- D. Signs of blunt injury or bleeding – flank hematoma, chest or abdominal wall contusion.
- E. Jugular veins – flat or distended.

### **Treatment**

- A. Assess airway and breathing, treat life-threatening difficulties (see Trauma Overview). Use assistant to provide cervical stabilization while managing ABCs.
- B. Control hemorrhage by direct pressure with clean dressing to wound. If needed, add tourniquet or hemostatic agents per protocol
- C. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- D. Immobilize cervical spine as appropriate, (relieve assistant performing cervical stabilization).
- E. O<sub>2</sub>, high flow (10-15 L/min). Titrate to pulse oximetry > 90% if possible.
- F. Transfer patient to board.
- G. IV – volume expander (NS or RL), large bore, TKO.
- H. If BP < 90 systolic and neck veins flat, transport rapidly and treat shock enroute
  - 1. Keep patient warm with blankets to prevent heat loss.
  - 2. Raise legs 10-12 inches.
  - 3. Consider fluid bolus of 20 ml/kg, or as directed.
  - 4. Monitor cardiac rhythm.
  - 5. Look carefully for possible sources of bleeding (abdomen, pelvis, chest, scalp, back).
- I. If BP < 90 systolic and signs of cardiogenic shock (distended neck veins), transport rapidly and consider
  - 1. Tension pneumothorax if respiratory status markedly deteriorating, with clinical findings of pneumothorax
    - a. Release occlusive dressings on open chest wounds.
    - b. Consider needle decompression.
  - 2. Pericardial tamponade if wound suspect (may have distant heart sounds, narrow pulse pressure)
    - a. Consider fluid bolus of 20 ml/kg.
  - 3. Cardiac contusion with typical ischemic chest pain or severe chest wall contusion
    - a. Monitor cardiac rhythm.
    - b. Consider cautious fluid bolus of 10 ml/kg enroute or as directed.

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- c. Lidocaine, 1 mg/kg IV for significant PVCs.
- J. If BP > 90, observe closely and transport.
  - 1. Perform secondary survey and record patient's problems.
  - 2. Maintain IV at TKO rate.
  - 3. Stabilize and splint fractures.
  - 4. Dress wounds as time allows.
- K. Recheck vital signs and neurologic status enroute – at least every 5 minutes with unstable patient.

**Specific precautions**

- A. Hypotension itself is a late sign of hypovolemic shock. Blood loss must be anticipated from the mechanism of injury. Often a patient may suddenly "go bad" if the subtle clues aren't noticed beforehand.
- B. Hypertensive and elderly patients can have significant hypotension at pressures higher than 90 systolic. Look for the adrenergic signs – vasoconstriction, sweating, mental alterations, and agitation. Treat the entire picture and not just the blood pressure.
- C. Neurogenic shock is caused by relative hypovolemia as blood vessels lose tone from spinal cord injury. Treat as for hypovolemia, and if hypotension persists, consider occult blood loss as an additional cause of shock.
- D. Occasionally, pain or cardiac contusion will cause inappropriate bradycardia. Consider also if an MI or a primary dysrhythmia may have caused the trauma. Fluid resuscitation should be cautious. Pain medication may also normalize the pulse if there are no contraindications.
- E. Another important and frequent cause of "relative" bradycardia (pulse < 100) in the face of hypovolemic shock is the patient on beta-blocker drugs (e.g., propranolol), who cannot respond to blood loss with a tachycardia. Patients with angina, prior MI, migraine, hypertension, dysrhythmias and other medical illnesses may be taking beta-blockers. Treatment is the same, but do not wait for the tachycardia!
- F. Recent literature has thrown some doubt on the wisdom of administering a large fluid bolus to all trauma patients who present in shock. Particularly in the face of ongoing internal hemorrhage, patients may do better with IVs at TKO until the bleeding can be stopped in the OR.

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## SPINAL TRAUMA

### Specific information needed

- A. Mechanism of injury and forces involved. Be suspicious with falls, airplane crashes, decelerations, diving accidents.
- B. Past medical history and medications.

### Specific objective findings

- A. Vital signs, including neurologic assessment.
- B. Level of sensory deficit. Presence of any evidence of neurologic function below level of injury. Priapism.
- C. Physical exam with careful attention to organs or limbs which may not have sensation.

### Treatment

- A. Assess airway and breathing. Treat life-threatening difficulties. Use controlled ventilation for high cervical cord injury associated with abdominal breathing. Use assistant to provide cervical stabilization while managing ABCs.
- B. Control hemorrhage. Stop scalp bleeding with direct pressure if possible. Continued manual pressure may be needed.
- C. Apply O<sub>2</sub>, Titrate to pulse oximetry > 90% if possible.
- D. Obtain initial vital signs, neurologic assessment, including Glasgow Coma Score.
- E. Immobilize cervical spine with firm cervical collar. Maintain stabilization manually until securely immobilized on spine board.
- F. Immobilize thoracic and lumbosacral spine with spine board. Move patient as little as possible and always move as a unit.
- G. Secure patient to board following transfer. Secure trunk first, then cervical spine, then extremities.
- H. IV – volume expander (NS or RL), large bore, TKO.
- I. If patient BP < 90 mm systolic and signs of hypovolemic shock
  - 1. Keep patient warm with blankets to prevent heat loss.
  - 2. Raise legs (or foot of spine board) 10-12 inches.
  - 3. Examine for possible sources of bleeding (abdomen, pelvis, chest, scalp, back).
  - 4. Administer fluid bolus of 20 ml/kg or as directed.
  - 5. Consider Dopamine in shock unresponsive to fluids and thought to be neurogenic in nature.
- J. Mark level of sensory deficit gently with pen on patient's skin to facilitate monitoring.
- K. Monitor airway, vitals, and neurologic status frequently at scene and during transport.

### Specific precautions

- A. Be prepared to tip entire board on side if patient vomits (patient must be secured to spine board or scoop stretcher –wide tape or straps anchored to both sides of board preferred).
- B. Neurogenic shock is likely with significant spinal cord injury. Raise the foot of the spine board or legs only, whichever is easier logistically. Be sure respirations remain adequate.
- C. If hypotension is unresponsive to simple measures, it is likely due to other injuries. Neurologic deficits make these other injuries hard to evaluate. Cord injury above the level of T-8 removes tenderness, rigidity, and guarding as clues to abdominal injury.

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- D. The patient with spinal trauma and normal neurologic function or only a partial deficit should not be treated more casually than the patient with a complete deficit. This is the patient who can benefit most from your conscientious splinting efforts and protection from further injury.
- E. Spinal immobilization for patients with primarily penetrating trauma is rarely necessary. Consider immobilization when there is an apparent neurological deficit, an impaled foreign body, or other indication of specific cord damage.

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## **SPECIAL TRAUMA PROBLEMS**

Certain trauma situations call for assessment and treatment that goes beyond the standard treatment given for the patient's presenting complaints and injury. Treatment of physical injuries should be as listed in the protocols, but the following special considerations should be noted

### **SEXUAL ASSAULT**

- A. History should not be more extensive than necessary from a medical standpoint. Legal and psychological details are best left to persons who will be able to use that information, follow it up with appropriate actions, and provide ongoing support to the patient.
- B. You can, however, help with the patient's psychological needs. Do not judge the victim, who already feels debased, worthless, and guilty, no matter how blameless. Allow the patient as much freedom of choice in dealing with the medical community as possible. Do as little controlling as possible - let the patient control any aspects of care that he or she can. ("We need to start an IV. Would you like that in your left arm or your right?")
- C. Remember that the radio waves are public. Particularly with sexual assault victims, refrain from names and details.
- D. There may be hesitancy on the part of the victim to accept assistance from the same sex as the assailant. If an attendant of the other sex is available, it may be preferable to allow that attendant to treat. Be aware, however, that this can be a chance to revive faith in the other sex. Allow the patient to choose how interactive he or she would like to be.
- E. You should encourage the victim to leave the same clothes on and not to bathe before coming to the hospital. This goes against a victim's instincts at the time but will help preserve legal evidence.
- F. Encourage the victim to seek treatment even if reluctant to call the police and initiate legal action. There is still important medical treatment that can be offered, and the hospital staff or crisis counselor may allow the patient a better understanding of legal choices.

### **CHILD ABUSE/NEGLECT**

- A. Observe child for evidence of other injury, healing old wounds, multiple bruises. Also note how child relates to adults, physical and emotional relations within family unit.
- B. Although some injuries, such as cigarette burns, are characteristic of child abuse, most abuse injuries are similar to many other injuries.  
Suspicious scenarios include
  - 1. Injured child without obvious mechanism. Injuries which do not match story or stories which are inappropriate to the child's age.
  - 2. Delay in seeking treatment.
  - 3. Blame on third party.
  - 4. Multiple different stories.
  - 5. History of multiple previous episodes of trauma.
- C. Don't accuse or judge. Observe, and share your observations with appropriate authorities. This is an instance where your skilled powers of observation in the field, and your ability to be discreet and to keep an open mind are most needed.

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- D. If abuse is suspected, transport the child, even if the injuries themselves do not warrant it. The same child may even be admitted for minor injuries to provide sufficient time to assess the situation and prevent serious injury or death in the future.

### **PREGNANT TRAUMA PATIENT**

- A. AVOID SUPINE POSITIONING in obviously pregnant patient. Pressure from the uterus on the inferior vena cava prevents venous return to the heart, and can result in severe hypotension. Turn patient to side (preferably left) or use your hands to hold uterus off central abdominal vessels.
- B. Blunt abdominal trauma is difficult to evaluate because the abdominal exam is unreliable. Deceleration forces can cause placental separation. Seatbelts should be worn, but lap belts should be low, next to the pelvis, and fit snugly (more injuries still occur due to lack of seatbelt than are caused by them). All obviously pregnant patients should be transported for close evaluation and observation.
- C. Think of eclampsia as a possible cause of injury in the pregnant trauma victim with altered mental state, seizures, or hypertension.
- D. The fetus is much more sensitive to hypoxia and hypovolemia than the mother. For this reason, O<sub>2</sub> should always be applied and treatment for blood loss should begin before hypotension becomes evident.

### **TRAUMA ARREST**

- A. Blunt trauma arrest – Confirm no respirations, no pulse. If there appears to be any chance of resuscitation (report of recent respiration, pulse, or movement, no apparent injury that would be incompatible with life)
1. Open airway, ventilate with bag-valve-mask.
  2. Intubate to secure airway.
  3. Needle decompression of chest if suspected tension pneumothorax.
  4. Contact base to consider terminating efforts if no response and transport time significant.
- B. Penetrating trauma arrest – Confirm no respirations, no pulse. If there appears to be any chance of resuscitation
1. Open airway, ventilate with bag-valve-mask.
  2. Intubate to secure airway.
  3. Needle decompression of chest if suspected tension pneumothorax.
  4. IV – volume expander (NS or RL), wide open to 20 ml/kg.
  5. Contact base to consider terminating efforts if no response and longer than 10 minute transport to definitive care.