

PREHOSPITAL TRAUMA GUIDELINES

FOR MICPs IN ALASKA



Prepared by:

Section of Injury Prevention and EMS

Division of Public Health

Department of Health and Social Services

Box 110616

Juneau, AK 99811-0616

(907) 465-3027

(907) 465-4101 (fax)

<http://www.chems.alaska.gov>

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INTRODUCTION

These Trauma Guidelines were written in an effort to promote more efficient care and transportation of the severely injured trauma patient.

They were designed to be used in the initial, and continuing, training of EMTs. These guidelines provide a framework for individual organizations and Physician Medical Directors for writing their own protocols. NOTHING in these guidelines authorizes an EMT to perform a specific procedure on a particular patient. If a Medical Director wishes to authorize an EMT to perform any procedure, or give any medication that is outside the scope of practice for the EMT (as specified in 7 AAC 26.040) the physician must comply with 7 AAC 26.670. 7 AAC 26.670 requires a training and evaluation plan be submitted to the state, and after approval, list of individuals who have completed the proposed training and testing be submitted to the state. Signing standing orders alone is NOT adequate to add procedures and/or medications to an EMT's scope of practice.

The EMT-I, EMT-II, and EMT-III examinations for certification include questions based on these guidelines.

These guidelines are meant to serve as a framework and provide a general approach to the trauma patient. To maximize the benefit of these guidelines on patient care, prehospital emergency care providers should discuss them with their physician medical directors so that, in addition to the recognition and management of the particular type of traumatic injury, each person involved in the prehospital care of the trauma patient knows:

1. who is in charge of the trauma patient at the scene;
2. what trauma care procedures are authorized for each level of certification and which are appropriate for his or her particular service;
3. what options exist for the transport of the trauma patient (air, ground, water);
 - a. how the special transport services, such as an air ambulance, are activated.
 - b. at what point in the care of the trauma patient this activation takes place.
4. the emergency medical service's policies and procedures for communicating with emergency department personnel/physicians during the care of the trauma patient; and
5. the emergency medical service's policies and procedures for adequately documenting trauma care.

The Medical Director of the EMS system should develop local protocols to identify significant trauma in the field that is likely to require surgical intervention.

The physician-approved field triage protocols should trigger a well defined and practiced transport process to an appropriate medical facility without delay. This may include bypassing a closer medical facility to transport a patient to a certified Trauma Center.

These guidelines are consistent with the material presented in national trauma training programs, such as the Basic Trauma Life Support and Prehospital Trauma Life Support Programs. Readers are encouraged to attend either of these programs and to practice their trauma care skills frequently.

Readers are encouraged to read the *Alaska Prehospital Transport and Transfer Guidelines*.

Notes regarding pneumatic anti-shock garment (PASG) use: Issues regarding the use of the PASG in rural trauma and the optimum blood pressure that should be maintained during resuscitation remain controversial. Individual MICPs should consult with their Physician Medical Directors and/or their standard operating guidelines/policies regarding the use of PASG.

Notes regarding assessment related terminology: These guidelines use terms related to patient assessment that are consistent with the National Standard Curriculum, EMT-Basic, Revised 1994. Unless the context indicates otherwise, an "initial assessment" is equivalent to a "primary survey" and a "detailed" assessment is equivalent to a "secondary survey." Other assessment related terms should be self explanatory.

Notes regarding changes to the format of this document: In past revisions of this document, patient assessment techniques were listed for each section. In this version, patient assessment is described once early in the document. In the sections dealing with a particular organ system, certain parts of the exam are highlighted as a reminder. An appropriate and complete patient assessment should still be performed on all trauma patients with a suspicious mechanism of injury.

PREHOSPITAL TRAUMA GUIDELINES

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TRAUMA AND TRAUMA ASSESSMENT

*The priorities in trauma management are to prevent further injury, provide rapid transport, notify the receiving facility, and initiate definitive treatment. **Trauma patients cannot be treated completely in the field.** On-scene time should be as short as possible unless there are extenuating circumstances, such as extrication, hazardous conditions, or multiple patients. Document these circumstances on the patient record. Determine how the patient should be transported as soon as possible so that activation of a special transport service, such as an air ambulance, if appropriate, can be performed in a timely manner. Notification of the receiving hospital of patient conditions and status should be done as early as possible. This allows the receiving hospital additional time to mobilize any necessary resources.*

***The pre-hospital assessment and management of a trauma patient should be performed under the direction of one person.** That director should be an individual who has been properly trained in the assessment and management of trauma patients and who has a complete understanding of local and regional triage and transport protocols and capabilities. Although the presence of alcohol or other drugs may mask some of the signs of severe trauma, assume that the patient's condition is caused by trauma until proved otherwise.*

“Despite a rapid and effective out-of-hospital and trauma center response, patients with out-of-hospital cardiac arrest due to trauma rarely survive. Those patients with the best outcome from trauma arrest generally are young, have treatable penetrating injuries, have received early (out-of-hospital) endotracheal intubation, and undergo prompt transport (typically <=10 minutes) to a trauma care facility. Cardiac arrest in the field due to blunt trauma is fatal in all age groups.”¹ Briefly assess and/or treat for field-correctable causes (e.g tension pneumothorax, airway obstruction). Further resuscitation is not indicated.² (see Appendix C)

BLS:

1. Take body substance isolation precautions. This is best performed en route to the call location.

¹ 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care: Part 10.7 Cardiac Arrest Associated with Trauma Basic Life Support. *Circulation* 2005;112; 25; originally published online Nov 28, 2005; page IV-146

² Hopson, Laura, Hirsh, Emily, Delgado, Joao, Domeier, Robert, McSwain, Norman, Krohmer, Jon. The National Association of EMS Physicians (NAEMSP) and the American College of Surgeons Committee on Trauma (COT) support out-of-hospital withholding or termination of resuscitation for adult traumatic cardiopulmonary arrest (TCPA) patients who meet specific criteria. *Journal of the American College of Surgeons*: Elsevier Science Inc. Vol. 196, No. 1, January 2003 Joint Position Statement. Pp. 106-112.

2. Ensure scene safety. First priority should be given to the safety of the rescuers and then to altering the scene to make it a safe working environment or, if necessary, moving the patient from the scene.
3. Perform a scene survey to assess environmental conditions and mechanism of injury and number of patients.
4. Establish patient responsiveness. Manually stabilize the spine. Protect patient from heat loss.
5. Open the airway:
 - a. Use the head tilt/chin lift if no spinal trauma is suspected.
 - b. Use the modified jaw thrust if spinal trauma is suspected.
6. Establish and maintain a patent airway while protecting the cervical spine. Suction as necessary. Insert an oropharyngeal or nasopharyngeal airway adjunct if the airway cannot be maintained with positioning. The nasopharyngeal airway is contraindicated in the presence of maxillary facial trauma.
7. Evaluate breathing – Is the patient breathing spontaneously? Are respirations adequate in rate and depth? Environmental factors should be considered when removing the patient's clothing for evaluation.
 - a. Look for:
 1. nasal flaring
 2. cyanosis
 3. rapid respirations (tachypnea)
 4. retractions
 5. asymmetry of chest wall
 6. open wounds or bruising of chest wall
 - b. Listen for:
 1. breathing
 2. abnormal breath sounds
 3. stridor – indicates partial airway obstruction
 4. gurgling sounds indicate fluid or blood in the airway.
 - c. Feel for:
 1. rib fractures
 2. crepitus
8. Initiate pulse oximetry, if available.
9. Treat based on findings:
 - a. If breathing is inadequate, assist ventilations with high flow, 100% concentration oxygen (e.g. bag-valve-mask, flow-restricted oxygen-powered ventilation device)

etc.). Two-rescuer bag-valve-mask ventilation has been found to be more effective, if there is an adequate number of rescuers. Consider the use of cricoid pressure (Sellick maneuver) to prevent/decrease gastric distention.³ Monitor for abdominal distention and the development of pneumothorax.

- b. If breathing remains difficult for the patient, and he/she has an obvious chest injury, refer to appropriate protocol for management of chest trauma.
- c. If breathing is adequate, administer high flow, 100% concentration oxygen using a non-rebreather mask or blow-by as tolerated.

10. Assess circulation and perfusion:

- a. Check for the presence of a pulse. If the patient is in cardiac arrest, follow the guidelines listed on page 1 of this document.
- b. Check rate and quality of pulse.
- c. Inspect for obvious bleeding.
- d. Check blood pressure.
- e. Observe skin color and temperature, and
- f. Observe capillary refill time – in children.

11. Control hemorrhage with direct pressure or a pressure dressing. This may include pelvic binding.

12. If the patient is hypotensive, place the patient in a supine position with feet higher than head and, if indicated by local protocol, consider the use of PASG.

13. Assess mental status.

14. If spinal trauma is suspected, place a rigid cervical collar and immobilize the patient as appropriate. Selective spinal immobilization may be appropriate if trained and authorized by the medical director.

15. Expose the patient as necessary to perform further assessments. Care should be taken to maintain the patient's body temperature.

16. Initiate transport to a higher level medical facility. Rescuers should begin transport no more than 10 minutes after their arrival on the scene unless extenuating circumstances exist.

17. Splint suspected fractures of long bones en route, as possible.

18. Perform focused history and detailed physical examination en route to the hospital if patient status and management of resources permit.

19. Reassess patient frequently throughout transport.

³ 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care: Part 4 Basic Life Support. *Circulation* 2005;112: 25; originally published online Nov 28, 2005;

20. Contact medical direction for additional instructions and/or notify receiving facility.

ALS:

1. Place an advanced airway device, if indicated. An assistant must maintain in-line cervical stabilization throughout this procedure. If intubation is made difficult by factors, such as clenched teeth, combativeness, etc., consider rapid sequence intubation. (See Appendix B: RSI)
2. Consider placing a gastric tube in any patient who requires assisted ventilations.
3. If a tension pneumothorax is suspected by mechanism of injury and as evidenced by severe respiratory distress, absent or decreased breath sounds, and hypotension/shock, perform needle decompression on the affected side with a large bore needle at the second intercostal space over the third rib at the midclavicular line.
4. Initiate cardiac monitoring. Treat cardiac dysrhythmias as dictated by standing orders.
5. Obtain intravenous access using age-appropriate large bore needle and an isotonic solution, (e.g. normal saline or lactated Ringer's). If the patient shows signs of shock, initiate intravenous access in two sites using large bore needles. Do not delay transport to obtain intravenous access; this can be done en route. Consider a saline lock if fluids are not immediately required.
6. Devices are available to initiate intraosseous (IO) access in all patient age groups and may be considered when peripheral IV access is unobtainable.
7. Consider fentanyl for treating pain in the multi-trauma patient, as it has a better hemodynamic profile than morphine.
8. Consider pressors for shock refractory to adequate fluid resuscitation. This intervention should be made only after direct contact with physician medical command.

Additional pediatric considerations:

Children experience different types of injuries and have different physiologic reactions to injury as compared to adults. Patient outcome depends on the time it takes to get the patient to the hospital. Therefore, assessment and treatment are frequently done at the same time and scene time should be minimized to less than 10 minutes, if possible.

Continual assessment of children is imperative. A child may initially appear stable, then decompensate suddenly.

PASG may be used in children over 40 lbs. if local protocol dictates. Do not inflate the abdominal section in children less than 10 years of age. (Do not rely on blood pressure as a sign of shock in children; it is a very late finding.)

If tension pneumothorax is suspected, perform needle decompression with an over-the-needle catheter at the second intercostal space over the third rib at the midclavicular line.

When obtaining intravenous access, use an age appropriate large-bore catheter with large-caliber tubing and administer normal saline or lactated Ringer's at a sufficient rate to keep the vein open. If the patient shows signs of shock, initiate intravenous access in two sites. Consider saline locking IVs if fluids are not immediately required. Carefully monitor fluid administration to avoid fluid overload in children.

If signs of shock are present (such as, tachycardia, decreased level of consciousness, poor color, capillary refill greater than 2 seconds, decreased blood pressure, etc.) administer a bolus of normal saline or lactated Ringer's at 20 cc/kg. Bolus therapy with reassessment is more effective than high IV flow rates for ensuring pediatric patients receive adequate fluids. Two additional fluid boluses at 20 cc/kg may be given if the patient remains in shock. If intravenous access cannot be obtained, consider intraosseous access in pediatric trauma patients with decreased consciousness.

HEAD AND SPINE TRAUMA

The recommendations for the management of traumatic brain injury (TBI) contained within these guidelines are adapted from the Prehospital Management of Traumatic Brain Injury developed by the Brain Trauma Foundation, © 2000. Field treatment is directed at preventing “secondary injury,” which is brain injury caused by hypoxia and shock after the initial injury has occurred. Evaluation and support of the patient’s ABC’s should be the first priority. As with all trauma patients, complete therapy for head and spine injuries must take place in the hospital. Delays at any level may be harmful to the patient.

*Patients with closed head injuries can worsen quickly, even though they appear stable initially. Although the presence of alcohol and other drugs may make evaluation of head injuries difficult, always assume symptoms are the result of the trauma and treat as such. **Routine use of hyperventilation in the patient with traumatic brain injury is not recommended.***

Objects penetrating the head and neck should be stabilized whenever possible. Objects that are impaled in the cheek may be removed, as compression of both sides of the wound is easily accomplished.

Injury-specific BLS considerations:

1. Perform patient assessment using the steps outlined on page 1 of these guidelines.
2. If pulse oximetry is available, monitor and maintain oxygen saturation (SpO₂) greater than 90%. Note that even a single instance of SpO₂ less than 90% can significantly affect patient outcome.
3. Ventilation and hyperventilation in the patient with TBI
 - a. If breathing is inadequate, assist ventilation using a bag-valve-mask device with high flow, 100% concentration oxygen. Monitor for gastric distention.
 - Adult, 10 breaths/minute;
 - Child, under age 8, 20 breaths/minute; and
 - Infants, 25 breaths/minute.
 - b. If breathing is adequate, administer high flow, 100% concentration oxygen using a non-rebreather mask or blow-by, as tolerated.
 - c. **If a TBI is suspected, hyperventilate the patient only if one or more of the following signs of brain herniation exists:**
 - Fixed or asymmetric pupils.
 - Abnormal extension (decerebrate posturing).
 - Glasgow coma scale (GCS) of less than 9 with a further decrease of 2 or more points.

Hyperventilation rate is:

- adult patient with high flow oxygen at a rate 20 breaths/minute;
- child under age 8, 30, breaths/minute; and
- infants, 35 breaths/minute.

4. Blood pressure in the head injured patient:

Hypotension in an adult, except as a terminal event, is not caused by isolated closed head injuries. You should assess the chest, abdomen, pelvis, and thighs for additional injuries. Patients with TBIs who also have external bleeding may suffer fatal blood loss; control bleeding with direct pressure.

5. Assess mental status using the GCS every five minutes to track changes. Changes in mental status are the most sensitive indicator of traumatic brain injury.
6. Evaluate pupil size and reactivity. A unilaterally dilated pupil or bilaterally fixed and dilated pupils is a sign of brain herniation and requires emergent interventions to lower the intracranial pressure (ICP). Unequal pupils in the conscious patient is not an indicator of brain herniation or increased ICP.
7. Remember to suspect spinal injuries in any patient with a head injury and significant mechanism of injury. Evaluate spinal cord integrity:
- a. In a conscious patient by recording ability to move extremities to command. Perform gross sensory exam with sharp sensation or light touch.
 - b. Document patient complaints of numbness, tingling, or shooting pain.
 - c. In an unconscious patient by recording presence or absence of extremity movement to painful stimulus.
8. Reassess patient frequently throughout transport, as a head injured patient may deteriorate rapidly. Changes in the ongoing exam can be more important than the initial exam.

Injury-specific ALS considerations:

In addition to the above instructions, providers trained and authorized beyond BLS may initiate the following treatments.

1. Perform advanced airway intervention if the airway cannot be maintained by the patient, if prolonged assisted ventilation is anticipated, if hypoxemia is not corrected by supplemental oxygen, or if the GCS is 8 or less.
2. Obtain intravenous or intraosseous access and, if needed, administer isotonic solution, (e.g. normal saline or lactated Ringer's). Avoid the use of dextrose-containing IV fluids in TBI patients (Treat hypoglycemia as indicated.).

3. In patients with multi-organ trauma with an associated TBI, titrate IVs to maintain systolic blood pressure above 90. A systolic BP below 90 has been shown to increase morbidity and mortality in the patient with a TBI⁴.

Additional pediatric considerations:

1. Children are anatomically prone to head injuries because of their large heads, weak neck muscles, and immature brain tissue. Head injuries in children are common. Blunt mechanisms like falls and motor vehicle crashes are the most common causes of head injuries in children.
2. Suspect a TBI in the child who:
 - is inconsolable,
 - is irritable,
 - has a high pitched cry,
 - vomits repeatedly,
 - is unusually quiet,
 - has difficulty walking (if ambulatory at the scene prior to EMS arrival),
 - has a bulging fontanel, and/or
 - has Battle's sign or raccoon eyes.
3. Children can present with signs of shock secondary to severe scalp lacerations. If a child with a severe scalp laceration is showing signs of shock, be sure to gain IV or IO access and give a 20 cc/kg bolus of normal saline or lactated Ringer's. Be sure to evaluate the pediatric patient to rule out internal bleeding.

⁴ Chesnut, RM, Marshall, LF, Klauber, MR, et al: The Role of Secondary Brain Injury in Determining Outcome from Severe Head Injury. *Journal of Trauma* 34:216-222, 1993.

GLASGOW COMA SCALE

BEST EYE OPENING

| Adult & Child | Infant (12 months) | Points |
|---------------|--------------------|--------|
| Spontaneous | Spontaneous | 4 |
| To Command | To Voice | 3 |
| To Pain | To Pain | 2 |
| None | None | 1 |
| | TOTAL | |

BEST VERBAL RESPONSE

| Adult & Child | Infant (12 months) | Points |
|------------------|--|--------|
| Oriented | Coos and Babbles (or crying after non-painful stimulation) | 5 |
| Confused | Irritable Cry | 4 |
| Inappropriate | Only cries to Pain | 3 |
| Incomprehensible | Moans to Pain | 2 |
| None | None | 1 |
| | TOTAL | |

BEST MOTOR RESPONSE

| Adult & Child | Infant (12 months) | Points |
|-------------------|-----------------------|--------|
| Obeys Command | Spontaneous Movements | 6 |
| Localizes Pain | Withdraws (Touch) | 5 |
| Withdraws | Withdraws (Pain) | 4 |
| Flexion to Pain | Flexion to Pain | 3 |
| Extension to Pain | Extension to Pain | 2 |
| None | None | 1 |
| | TOTAL | |

| | |
|------------------------------------|--|
| Total: Best Eye Opening | |
| Total: Best Verbal Response | |
| Total: Best Pain Response | |
| Glasgow Coma Score | |

CHEST TRAUMA

Chest trauma can lead to severe internal injuries that are often difficult to diagnose. A history of chest trauma should lead rescuers to suspect a serious injury, and patients should be treated with that expectation.

Three major chest injury syndromes can lead to rapid death. They must be recognized and treated rapidly. They include:

- *Bleeding from rupture of a major chest vessel;*
- *Mechanical decrease of cardiac output (which may be caused by tension pneumothorax, cardiac tamponade or cardiac contusion with or without dysrhythmia); and*
- *Respiratory distress (which may be caused by tension pneumothorax, flail chest, pulmonary contusion or an open chest wound).*

If chest injury interferes with breathing, it must be managed during the initial assessment.

Objects penetrating the chest wall should be stabilized whenever possible, and not removed unless absolutely necessary for extrication or transport.

Injury-specific BLS considerations:

1. Examine the patient looking for distended neck veins. Look at the chest wall for asymmetry of movement, open wounds, and bruises. Expose the patient's chest, as needed, to inspect the entire chest wall, front and back, maintaining cervical immobilization and log rolling when indicated. Respiratory distress, despite an open airway, may suggest a tension pneumothorax, a flail chest, or an open chest wound.
 - a. Signs of a tension pneumothorax include diminished breath sounds, hypotension, respiratory distress, distended neck veins, subcutaneous emphysema, shock, apprehension/agitation, and increasing resistance to ventilation.
 1. If a penetrating chest wound has been sealed, temporarily unseal the wound and allow air to escape.
 2. Assist ventilation with positive pressure oxygen if available.
 3. Transport patient in the position of comfort unless otherwise contraindicated.
 - b. Signs of flail chest may include paradoxical movement of the chest wall, or crepitus of multiple ribs in two or more areas. Assist ventilation with positive pressure as needed to maintain adequate oxygenation.
 - c. A wound in the chest may be an open chest wound, especially when it presents with subcutaneous emphysema, and air movement through the opening.
 1. Cover with a sterile occlusive dressing taped on three sides.
 2. Observe closely for signs of developing tension pneumothorax.
2. Listen to the chest in all lung fields, anterior and posterior, for the movement of air.

3. Assess circulation and perfusion:
 - a. Check for the presence of a pulse. If a patient with chest trauma has no pulse, follow the guidelines on page 1 of this document.
 - b. Look for signs of shock. Hypotension (without evidence of external bleeding) suggests internal bleeding, tension pneumothorax (see above) or cardiac tamponade. If shock is found or suspected by mechanism, treat for shock.
4. Assess the chest for tenderness, rib and clavicle fractures and crepitus.

Injury-specific ALS considerations:

In addition to the above instructions, providers trained and authorized beyond BLS may initiate the following treatments.

1. Positive pressure ventilation may be needed, but is likely to worsen unrelieved tension pneumothorax. Be prepared to decompress the patient's chest. If a tension pneumothorax is suspected by mechanism of injury and as evidenced by hypotension, respiratory distress, and/or diminished breath sounds, perform needle decompression with a large bore needle at the second intercostal space over the third rib at the midclavicular line.
 - a. This is an airway procedure and must be performed early, if indicated.
 - b. A patient may have bilateral pneumothoraces; if condition does not improve after decompression of one lung, decompress the other side.
2. Initiate cardiac monitoring.
3. Consider analgesia for isolated chest trauma.
4. Treat for hypotension.

Additional pediatric considerations:

1. Flail chest is uncommon in children because of rib flexibility.
2. Indications for needle decompression are the same in the pediatric patient as in the adult. The over-the-catheter needle is placed at the second intercostal space at the midclavicular line.

ABDOMINAL TRAUMA

Pre-hospital care of abdominal injuries should focus on controlling external bleeding and rapid transport as there are no specific prehospital treatments for internal bleeding. Penetrating trauma injures the area of entry and may damage any tissue along the line of penetration. Blunt trauma may be widely transmitted and cause damage to any or all organs within the abdominal cavity. Trauma to the abdomen may also cause injury to organs outside the abdominal cavity including those in the chest. Injuries from the nipple line through the tenth rib can involve either the chest and/or abdomen. Ongoing re-evaluation of the abdomen includes assessment of the chest as well.

As with all trauma patients, complete treatment for abdominal injuries must take place in the hospital. Delays at any level can be harmful to the patient. Evaluation of abdominal trauma is part of the rapid trauma assessment. It should be performed only after the patient's ABCs have been evaluated and supported.

Objects penetrating the abdominal wall should be stabilized whenever possible, and not removed unless absolutely necessary for extrication or transport.

Injury-specific BLS considerations:

1. Assess the abdomen for tenderness, rigidity, and distension.
2. Reassess abdomen every 5 – 10 minutes, for tenderness, rigidity and distention. Shock, increasing distention, and abdominal rigidity are signs of intra-abdominal bleeding, although a person may have life-threatening bleeding without distention or abdominal rigidity.
3. Any organs protruding from abdominal wounds should not be replaced into the abdominal cavity; cover the organs with saline-moistened gauze and a vapor barrier.⁵
4. If mechanism of injury permits, transport the patient in the position of comfort.

Injury-specific ALS considerations:

ALS considerations for the patient with abdominal injuries are those listed in the initial assessment section of this document (starting on page 1).

Additional pediatric considerations:

Solid organs of the upper abdominal cavity (the liver, spleen and kidneys) are proportionally larger and more exposed in children, and the abdominal muscles of the child are relatively underdeveloped and the

⁵ Campbell, John, (ed.) BTLS. Pearson Education Inc.: Upper Saddle River. 2004. p. 194.

ribs are more pliable.⁶ This predisposes pediatric patients to potentially serious blood loss and shock from abdominal injuries.

Abdominal distention decreases lung capacity and makes the pediatric patient more difficult to ventilate. ALS providers should consider placement of a gastric tube.

⁶ Dieckmann R, Brownstein D, (ed.) Pediatric Education for Prehospital Providers. 2nd edition. Chapter 6. Trauma. Jones and Bartlett Publishers: Boston. 2006. Page 133.

PELVIC TRAUMA

A person may lose enough blood from pelvic fractures to exsanguinate. Disruption of the pelvic ring increases potential space in the pelvic cavity. This increased space will accommodate more blood than the standard pelvis. The goals of pelvic immobilization are to decrease movement of the bones and to decrease the potential space for bleeding. Apply circumferential pressure to tamponade internal hemorrhage.

Signs of pelvic fracture may include instability, crepitus, decreased peripheral pulses, swelling, and blood at the urinary meatus.

When assessing for pelvic trauma, gentle downward, then inward pressure should be applied to the iliac crests. If instability or crepitus is noted, this test should not be repeated.

1. Control external hemorrhage with direct pressure or a pressure dressing. Hemorrhage control may be improved by closing and stabilizing pelvic fractures.
2. Pelvic fractures may be stabilized in several ways, three of which are easily applied in the pre-hospital setting.⁷
 - a. Use of the pelvic sheet wrapping technique⁸
 - b. Commercially available pelvic binding device
 - c. Application of the PASG^{9,10}
3. Assess circulatory, motor, and sensory function before and after application of pelvic stabilization.
4. Attempt to minimize unnecessary movement in patients with pelvic fractures.

⁷ American College of Surgeons, Committee on Trauma. Advanced Trauma Life Support for Doctors: ATLS Student Course Manual 1997. Chicago, 1987. Pg 251.

⁸ Simpson, T, Krieg, J. C., Heuer, F., and Bottlang, M. Stabilization of Pelvic Ring Disruptions with a Circumferential Sheet Journal of Trauma, Injury, Infection and Critical Care. Vol. 52, No. 1. Page 158.

⁹ Bledsoe, B. E., Poerter, R. S., Cherry, R. A. Paramedic Care: Principles and Practice Trauma Emergencies. Brady: Upper Saddle River. 2001. Pg. 246.

¹⁰ National Association of EMTs. PHTLS: Basic and Advanced Prehospital Trauma Life Support, ed. 5, St. Louis, 2003, Mosby.

EXTREMITY TRAUMA

In the severely injured patient, management of extremity injuries takes a relatively low priority. Most extremity hemorrhage can be controlled by direct pressure or pressure dressings. As with all trauma patients, definitive treatment for extremity injuries takes place in the hospital. Delays at any level can be harmful to the patient. Evaluation of extremity trauma is part of the focused physical exam and should be performed only after the patient's ABCs have been evaluated and supported.

Consider femur or pelvic fractures when the degree of shock seems greater than indicated by the amount of external bleeding.

Injury-specific BLS considerations:

1. Control external hemorrhage with well-aimed direct pressure or a pressure dressing, or elevation and pressure points. A tourniquet should be used if bleeding cannot be controlled by other methods. Though tourniquets are infrequently needed, do not delay application when other bleeding control methods have failed.
2. Hemorrhage control in a patient with femur fracture(s) may be improved by using a traction splint, which has been shown to decrease the potential space in the thigh thereby reducing the amount of blood that can accumulate there. If there is severe bleeding over the fracture site, the EMT must strive to control the bleeding; this may involve putting pressure directly over the fracture.
3. Examine the patient for extremity injuries (deformities, contusions, avulsions, amputations, punctures, penetrations, burns, tenderness, lacerations, or swelling).
4. Check for motion and sensation distal to deformities (both light touch and sharp sensation should be checked).
5. Check circulation distal to deformities.
6. The primary concern when treating extremity injuries is to maintain proper distal circulation beyond the site of the injury. This may involve straightening the extremity. ("Make limbs look like limbs.") Stop if severe resistance is encountered or if the patient has significantly increased pain during an attempt at straightening the extremity. No more than two attempts at straightening the limb should be made.
 - a. In general, joint injuries are left in the position found if there is adequate circulation. If there is no pulse distal to the joint injury, an EMT should attempt to align the joint in its normal anatomic position by applying traction.
 - An exception is the severely deformed ankle, which should be moved into alignment regardless of circulatory status.
 - b. Straighten any grossly angulated long bone into its anatomic position by applying traction.

7. When splinting open fractures, apply the appropriate splint (e.g. traction splint for fractured femurs) in the usual manner. The bone ends may slip under the skin during splinting, this is acceptable, as the patient will need to have the wound cleaned in the operating room whether the bone ends remain above the skin or have slipped back into the wound. (Notify the receiving facility if this occurs.) Flush gross contamination from wounds before applying the splint. If, after attempting to straighten the extremity, the bone ends remain above the skin, cover with a moist dressing.
8. Amputated parts¹¹ should be wrapped in sterile gauze moistened with normal saline, protected from contamination (e.g., placed in an examination glove or Ziploc[®]-type bag) and put in ice water. Do not allow the amputated part to freeze.
9. A cold pack may be applied to the site of an extremity injury to help reduce pain and swelling. Care should be taken not to freeze the tissues.

Injury-specific ALS considerations:

Pain management is strongly encouraged for patients with isolated extremity injuries, unless there is a contraindication to pain medication (e.g. hypotension, allergy). Medicating the patient before splinting may be appropriate in the patient with an isolated extremity injury.

Additional pediatric considerations:

Bones in children are more pliable than those in adults; they are prone to fractures that involve the bone bending (e.g. “greenstick fractures”), which may be more difficult to straighten.

Children may fracture their bones at the growth plates, which are located near joints. Injuries involving joints should only be straightened when there is decreased circulation distal to the injury (unless it is an ankle injury).

3. If using commercially available devices to splint fractures in children, be sure that they are of an appropriate size for the child.

¹¹ An increasing number of communities in Alaska are developing replantation capabilities. Emergency medical service agencies should consult with local and regional replantation specialists to optimize protocols and standing orders.

BURNS

Effective treatment of patients with burns must be started as soon as possible after injury, as these patients frequently require specialized care which includes fluid resuscitation, pain management, and wound care. The goal is to transfer the patient to a facility capable of providing the necessary level of care for that individual. Because of long transport times and weather delays, individuals providing initial care must be familiar with the care of a major burn injury for the first 24 – 48 hours.

Burns that require specialized care in a recognized burn center or unit include¹²:

- *Partial-thickness and full-thickness burns of greater than 10% total body surface area (TBSA) in patients <10 years of age or >50 years of age.*
- *Partial-thickness and full-thickness burns of greater than 20% TBSA in all other patients.*
- *Partial-thickness and full-thickness burns involving the face, eyes, ears, hands, feet, major joints, genitalia, or perineum.*
- *Full-thickness burns totaling 5% TBSA or more in any age group.*
- *Electrical burns including lightning injury.*
- *Significant chemical burns.*
- *All burns associated with inhalation injury.*
- *Circumferential burns of the chest, neck, or extremities.*
- *Burns associated with concomitant major trauma.*
- *Burn injury occurring in patients with pre-existing medical disorders.*
- *Burn injury in patients who will require special social and emotional or long-term rehabilitative support, including cases involving suspected child abuse and neglect.*

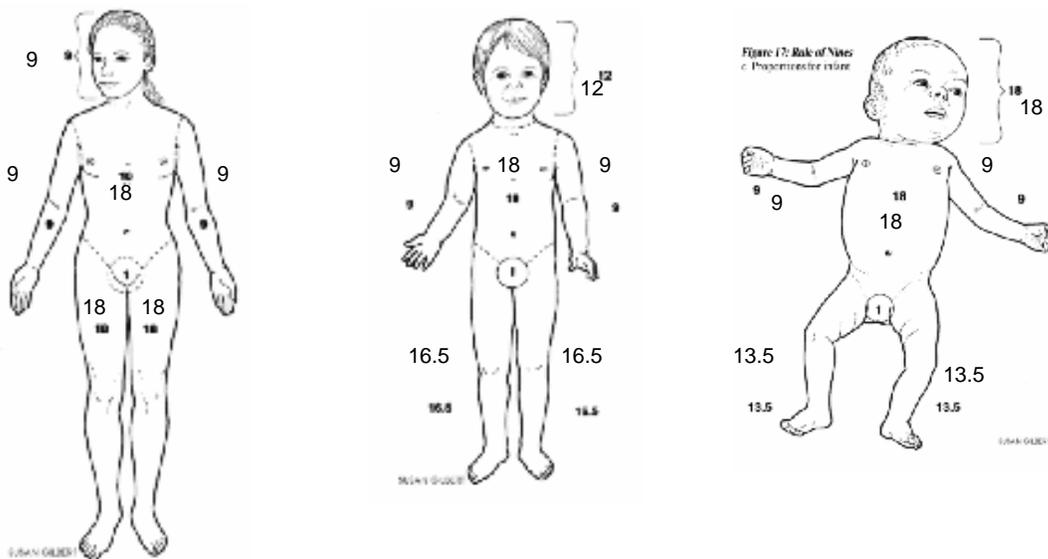
Injury-specific BLS considerations:

1. If hazardous materials are involved, contact an appropriate agency before approaching the patient. Take care to protect yourself from chemicals or electric current.
2. Stop the burning process. If on scene quickly after the burn occurred, cooling affected parts (e.g. with cool water immersion) may limit the depth and extent of the burn. More than a few minutes after the burn, there is little benefit except pain relief. Note that with burns from tar, asphalt, paraffin or oils that retain heat (or when melted fabric adheres to skin) cooling may help for a longer period of time.
3. If cooling for pain relief, do not cool or moisten more than 10% of the TBSA at any one time. This can cause hypothermia.
4. Remove all clothing and jewelry in the area of the burn and distal to the injury.
5. When treating patients with chemical burns, it is imperative to ensure rescuer safety. Patients contaminated with chemicals should have their clothing removed. Do NOT transport

¹² Adapted from the American Burn Association and American College of Surgeons list for burns that usually require referral to a burn center.

patients prior to appropriate decontamination. Notify the receiving facility of a patient with chemical exposure to allow adequate time for preparation. All chemical burns should be flushed with copious amounts of water.

- Brush dry chemicals off the skin before flushing.
 - For chemical burns of the eye, flush the eye immediately with at least one liter of normal saline or water (at least 10 to 20 minutes is preferred). More fluids may be beneficial, especially if the chemical is alkaline.
6. Administer high flow, 100% concentration oxygen by non-rebreather mask for potential inhalation injury or any serious burn. Consider the possibility of carbon monoxide or other toxic inhalation. Oxygen saturation readings may be falsely elevated (device reads “something” attached to hemoglobin, not necessarily oxygen).
 7. Assess circulation and perfusion. Circumferential burns of extremities can interfere with perfusion of that extremity.
 8. If spinal trauma is suspected, place a rigid cervical collar and immobilize the patient as appropriate.
 9. Consider ALS intercept for patients with serious burns and electrical injuries; in electrical injuries there is a possibility of cardiac dysrhythmias.
 10. Estimate the TBSA involved. The “Rule of Nines” provides a rough estimate of TBSA involved.



Describe the body surface area as well as the depth of burn (e.g. 30% superficial burn, 20% partial thickness, and 15% full thickness burn).

| Body Part | % - Total Body Surface | | |
|------------------------------|------------------------|-------|--------|
| | Adult | Child | Infant |
| Arm (shoulder to fingertips) | 9% | 9% | 9% |
| Head and neck | 9% | 12% | 18% |
| Anterior Trunk | 18% | 18% | 18% |
| Posterior Trunk | 18% | 18% | 18% |
| Leg (groin to toe) | 18% | 16.5% | 13.5% |

11. Apply dressings to burns as tolerated.

- In burns over 10% BSA, apply a dry sheet, a dry burn sheet or dry sterile dressings to burn areas. Insulate the patient over this dressing to lessen the chance of hypothermia.
- In burns less than 10% BSA, apply moist dressings (e.g. commercially available burn dressings or saline-soaked gauze)
- A vapor barrier may be useful in patients with longer transport times.

Injury-specific ALS considerations:

1. Be alert for signs of inhalation injury (e.g. stridor, muffled voice, singed facial/nasal hairs, soot around nose or mouth, carbonaceous sputum, confinement in an enclosed space fire). Be prepared to secure the airway. Patients whose burn is more than a few hours old may have elevated potassium levels, care should be taken if considering the use of succinylcholine.
2. If the injury involves an electrical burn, initiate cardiac monitoring. Treat cardiac dysrhythmias as directed by your standing orders.
3. Start two large bore IVs in patients meeting any of the burn criteria in the beginning of this section. These may be inserted through burn area, if necessary.
4. Fluid administration:
 - First 24 hours: 4cc normal saline (NS) or lactated ringers (LR) x patient weight (Kg) x %TBSA (for fluid calculations include only partial thickness and full thickness burns). If more than two or three liters of fluid are to be given lactated ringers is preferred.
 - Half of this amount is to be given in the first 8 hours after injury not the time after arrival at the patient's side. (Note: this means that the EMS provider should determine the time of injury)
 - The remaining half is to be given over the next 16 hours.

Example: A 70 Kg man who had sustained a 50% TBSA would require a total of 14,000cc in the first 24 hours, 7,000cc would be given in the first 8 hours. If the patient is not seen until 4 hours after the time of burn, that amount should be given over the next 4 hours. Second 24 hours: give normal maintenance fluids in sufficient volume to maintain a normal urinary output.

4cc normal saline (NS) or lactated Ringer's (LR) x 70 (Kg) x 50 %TBSA
= 14,000 cc in the first 24 hours

5. Insert a Foley catheter. The goal for urine output in patients with burns is 0.5 to 1.0 cc/kg/hour in adults and at 1 cc/kg body weight up to 30 kg body weight in children.
6. Electrical burn fluid management:
 - In electrical burns where there is a large amount of pigment (hemoglobin or myoglobin) in the urine, the urinary output should be maintained at 1.0 – 2.0 cc/Kg/hour until the urine is grossly clear, then fluids may be cut back to maintain the output in the range of 0.5 to 1.0 cc/Kg/hour in adults.
 - In addition, 44 – 50mEq of NaHCO₃ per liter of LR is administered to keep the urine alkaline as long as visible pigment is present.
7. Insert nasogastric tube if burns are 20% TBSA or more.
8. Pain relief: Morphine should be given in repeated small doses IV titrated to effective pain control; monitor for respiratory depression.
9. Give all medications intravenously.
10. Consider early escharotomy in a patient with circumferential thoracic burns. In a situation with delayed or prolonged transport, escharotomy may be appropriate in the patient with circumferential extremity burns.

Additional pediatric considerations:

Children under 5 years of age represent the age group most often found with burns resulting from child abuse. Look for characteristic burns that should make you suspect they are the result of child abuse. The child with burns to the back, buttocks, and posterior neck should alert your suspicion of abuse. Circumferential scald burns of hands or feet that are clearly demarcated and uniform with no splash marks are also characteristic of child abuse.

Glucose may be necessary in a child with a severe burn. Monitor blood sugar periodically and treat with a bolus of glucose as needed.

When measuring TBSA in children, an alternate method is to use the child's palm (not including the fingers)¹³, or clenched fist, which equals 1% of the body surface area. This serves as a quick method. But be sure to use the child's palm or fist and not your own.

¹³ American College of Surgeons, Committee on Trauma. Advanced Trauma Life Support for Doctors: ATLS Student Course Manual 1997. Chicago, 1997. Pg 276.

Appendix A: Pneumatic Anti Shock Garment (PASG) Guidelines

Note: The American College of Surgeons states in their Advanced Trauma Life Support Guidelines that the efficacy of pneumatic anti-shock garment in the rural setting remains unproven and, in the urban prehospital setting, controversial. These protocols specify 90 mmHg as a target for the patient's systolic blood pressure. Currently, there is a great deal of research concerning the optimum blood pressure to be achieved and maintained during trauma resuscitation efforts and readers are advised to consult their local physician medical director when developing or revising standing orders and protocols.

These guidelines do not take a position on the use of PASG in the treatment of shock; the use of PASG is a local physician medical director decision.

1. PASG Indications

- a. Pelvic or multiple leg fractures. If patient is normotensive, inflate only until fractures are immobilized
- b. Signs of shock (rapid, weak pulse, pale, rapid breathing, clammy skin, altered level of consciousness, low blood pressure, etc.)

2. Contraindications

- a. Absolute:
 - Pulmonary edema
- b. Relative:
 - DO NOT inflate abdominal section if the patient is obviously pregnant, has protruding bowels or has an impaled object in the abdominal area.
 - Known diaphragmatic rupture
 - Uncontrolled hemorrhage outside the confines of the garment, e.g. thorax, upper extremity, scalp, face or neck.

Application and Inflation Procedures

- Procedures for the application and inflation for the PASG are listed in the Alaska EMS Skills Sheets adopted by reference in 7 AAC 26.999 (59).

4. Special Points

- a. The PASG should be inflated on the basis of the patient's vital signs and not the pressure within the suit.
- b. DO NOT DEFLATE the PASG in the field except when a patient develops pulmonary edema and or sudden respiratory distress. In this case, seek advice from the local physician medical director to determine if deflation is appropriate for this patient.
- c. Be alert for pressure changes caused by altitude and temperature variations.
- d. PASG can be used in children over 40 lbs. if local protocol dictates. Do not inflate the abdominal section in children less than 10 years of age.

Appendix B: Rapid Sequence Intubation (RSI)

RSI refers to the nearly simultaneous administration of a neuromuscular blocking agent and a potent sedative agent to induce motor paralysis and unconsciousness for the purpose of facilitating endotracheal intubation. The risk of this procedure limits it to those who have been specially trained and are experienced in intubation.

Caution:

- Rapid sequence intubation temporarily paralyzes the patient. This means loss of ability to breath, protect the airway, and indicate distress. If not performed properly, it may worsen an already bad situation. It should only be performed by specially trained personnel.

Indications:

- To assist in intubation in a conscious patient or those with an intact gag reflex; to decrease risk of aspiration
- To allow transport of critically ill or injured or combative patients; and
- To minimize the increase in intracranial pressure during intubation

Equipment needed:

- Monitoring devices – cardiac monitor, pulse oximetry, BP cuff, end tidal CO₂ detector,
- Endotracheal tubes of various sizes with functioning cuffs as appropriate
- Stylette
- Laryngoscope with functioning light and blades (Macintosh and/or Miller)
- Suction equipment (tonsil tip, endotracheal)
- 10 mL syringe
- Devices for insuring correct placement
- BVM connected to an oxygen source to insure 100% oxygen
- Magill forceps – to remove foreign body or assist with tube placement
- Other advanced airway equipment (for failed endotracheal intubation)
- Patient-specific dosages of sedating, pretreatment and neuromuscular blocking agents.

Procedure:

Prepare – Brief patient and team. Set up alternative airway equipment. Reevaluate need and predicted difficulty.

Pre-Oxygenate – oxygenate 3-5 minutes on 100% NRB or 3-4 vital capacity breaths or 3-4 breaths using BVM manual ventilation with Sellick maneuver

Pre-medicate – administer drugs to minimize side effects of RSI

- a. Atropine 0.5 mg for adults, 0.02 mg/kg for children to prevent bradycardia and vagal effects of succinylcholine and to dry secretions (must be used in pediatric patients)
- b. Lidocaine 1.5-3.0 mg/kg to decrease the physiologic effects of laryngoscopy and endotracheal tube placement. It may reduce cardiovascular side effects as well.

Sedate

- a. Morphine (adults 2-5 mg; children 0.2-0.3 mg/kg)
- b. Diazepam (adults 2-5 mg)

- c. Midazolam (adults 1-2 mg; children 0.2 mg/kg)
- d. Etomidate (adults 0.2-0.3 mg/kg)

Induce - neuromuscular blockade

- a. Administer succinylcholine 1.5 – 2 mg/kg IVP
- b. Neuromuscular agents only block neuromuscular function, they do NOT produce amnesia or analgesia

Monitor - for action and side effects of medication

Intubate - Perform endotracheal intubation and confirm tube placement per American Heart Association ACLS procedures

Assess patient's status before, during and after intubation

- a. Assess patient's cardiovascular status and response to RSI
- b. Assess patient's response to medication
- c. Monitor patient's cardiovascular status, return of motor function and ability to follow commands.

Document

- d. Mental status prior to and after procedure
- e. Hemodynamic status before, during, and after procedure
- f. Dosages and times of IV medications will be documented in the medical record along with the patient's response
- g. Tube placement including size of tube used, position of tube, and confirmation techniques
- h. Patient's response to procedure

If not Successful

- Ventilate with BVM prn to restore baseline oxygen saturation.
- Reattempt intubation with the most experienced practitioner.
- If further attempts fail, continue to attempt ventilation.
- Place an alternative advanced airway device
 - Combi-tube
 - Laryngeal Mask Airway
 - Cricothyrotomy-if unable to ventilate
- DO NOT administer additional induction agents or sedatives.
- DO consider the reversal of sedative agent and neuromuscular blocking agent.

Appendix C: Traumatic Cardiopulmonary Arrest

The National Association of EMS Physicians (NAEMSP) and the American College of Surgeons Committee on Trauma (COT) support out-of-hospital withholding or termination of resuscitation for adult traumatic cardiopulmonary arrest (TCPA) patients who meet specific criteria.

1. Resuscitation efforts may be withheld in any *blunt* trauma patient who, based on out-of-hospital personnel's thorough primary patient assessment, is found apneic, pulseless, and without organized ECG activity upon the arrival of EMS at the scene.
2. Victims of *penetrating* trauma found apneic and pulseless by EMS, based on their patient assessment, should be rapidly assessed for the presence of other signs of life, such as pupillary reflexes, spontaneous movement, or organized ECG activity. If any of these signs are present, the patient should have resuscitation performed and be transported to the nearest emergency department or trauma center. If these signs of life are absent, resuscitation efforts may be withheld.
3. Resuscitation efforts should be withheld in victims of penetrating or blunt trauma with injuries obviously incompatible with life, such as decapitation or hemicorporectomy.
4. Resuscitation efforts should be withheld in victims of penetrating or blunt trauma with evidence of a significance time lapse since pulselessness, including dependent lividity, rigor mortis, and decomposition.
5. Cardiopulmonary arrest patients in whom the mechanism of injury does not correlate with clinical condition, suggesting a nontraumatic cause of the arrest, should have standard resuscitation initiated
6. Termination of resuscitation efforts should be considered in trauma patients with EMS-witnessed cardiopulmonary arrest and 15 minutes of unsuccessful resuscitation and cardiopulmonary resuscitation (CPR).
7. Traumatic cardiopulmonary arrest patients with a transport time to an emergency department or trauma center of more than 15 minutes after the arrest is identified may be considered nonsalvageable, and termination of resuscitation should be considered.
8. Guidelines and protocols for TCPA patients who should be transported must be individualized for each EMS system. Consideration should be given to factors such as the average transport time within the system, the scope of practice of the various EMS providers within the system, and the definitive care capabilities (that is, trauma centers) within the system. Airway management and intravenous (IV) line placement should be accomplished during transport when possible.
9. Special consideration must be given to victims of drowning and lightning strike and in situations where significant hypothermia may alter the prognosis.
10. EMS providers should be thoroughly familiar with the guidelines and protocols affecting the decision to withhold or terminate resuscitative efforts.
11. All termination protocols should be developed and implemented under the guidance of the system EMS medical director. On-line medical control may be necessary to determine the appropriateness of termination of resuscitation.
12. Policies and protocols for termination of resuscitation efforts must include notification of the appropriate law enforcement agencies and notification of the medical examiner or coroner for final disposition of the body.
13. Families of the deceased should have access to resources, including clergy, social workers, and other counseling personnel, as needed. EMS providers should have access to resources for debriefing and counseling as needed.
14. Adherence to policies and protocols governing termination of resuscitation should be monitored through a quality review system.

Hopson, Laura, Hirsh, Emily, Delgado, Joao, Domeier, Robert, McSwain, Norman, Krohmer, Jon. The National Association of EMS Physicians (NAEMSP) and the American College of Surgeons Committee on Trauma (COT) support out-of-hospital withholding or termination of resuscitation for adult traumatic cardiopulmonary arrest (TCPA) patients who meet specific criteria. Journal of the American College of Surgeons: Elsevier Science Inc. Vol. 196, No. 1, January 2003 Joint Position Statement. Pp. 106-112.