SECTION: Adult Trauma Emergencies

REVISED: 07/2021

Section 4

ADULT TRAUMA EMERGENCIES

This page intentionally
left blank.

SECTION: Adult Trauma Emergencies

PROTOCOL TITLE: Injury – General Trauma Management

REVISED: 06/2015

Protocol
4-1

TRAUMA PATIENT ASSESSMENT

OVERVIEW
Each year, one out of three Americans sustains a traumatic injury. Trauma is a major cause of disability in the United States. According to the Centers for Disease Control (CDC) in 2008, 118,021 deaths occurred due to trauma. Trauma is the leading cause of death in people under 44 years of age, accounting for half the deaths of children under the age of 4 years, and 80% of deaths in persons 15 to 24 years of age.

As a responder, your actions within the first few moments of arriving on the scene of a traumatic injury are crucial to the success of managing the situation. Within these moments, you must size up the situation, mitigate as many hazards as possible, establish incident command, rapidly triage patients and ultimately assess, treat and extricate patients from the scene. In doing so, you must decide when to extricate a patient and what treatment is essential to improve the patient's chances of survival, based on your knowledge, previous experience and a problem-based assessment algorithm.

Rapid transport of the trauma patient is essential to improving patient outcome.

The trauma patient varies in presentation based on the type and mechanism of injury. Primarily, the pre-hospital EMS provider is concerned with five areas in the field; securing the scene to protect both rescuers and patients, conducting a primary assessment and managing any life threats, performing a rapid trauma assessment, extricating the victim rapidly while protecting the cervical spine, and immobilizing and transporting the victim to an appropriate facility while conducting a secondary and ongoing surveys.

SCENE SURVEY:

Summary of Scene Survey
Evaluate situation / scene for potential safety hazards. Obtain an overview of the scene to determine Mechanism of Injury (MOI) include damage to vehicle, structures, furniture, etc. Wear personal protective equipment (PPE) appropriate to hazards of the scene and / or patient. Gain access to the patient. Determine the number of patients and additional resources needed.

As with all scene responses, assessment of the situation begins from the moment of first dispatch. You must not only consider the information received, but take into account the time of day, traffic, weather, safety issues and potential resources that may be required. As you arrive, the first concern should be to assess the scene for safety of responding pre-hospital EMS providers and to develop an index of suspicion for potential injuries based upon the scene and mechanism of injury. Your safety always comes first, followed by your team, then your patient. Once it is determined that the scene is manageable, begin patient triage. There has been some controversy as to which triage method or methods should be used, as there are at least, nine different triage tools available

worldwide, including two pediatric versions, but there is little evidence supporting one method over the other. The most common methods found in literature are Simple Triage and Rapid Treatment (START) and JumpSTART (the pediatric version of START), which are both used in North America.

PRIMARY ASSESSMENT:
Once all hazards have been mitigated and you can safely function, you should continue on to the primary assessment to look for any life-threatening injuries. These are injuries and instability of the respiratory and cardiovascular systems that would most likely be fatal within minutes if they are not immediately found and corrected. The approach to the trauma patient is based on the same primary assessment of the patient's airway, breathing, circulation, neurologic disability, and exposure used for all patients. Unlike a medical patient, the mechanism of injury should also be quickly determined and considered.

A. AIRWAY / C-SPINE STABILIZATION / LEVEL OF RESPONSIVENESS:

Summary of Primary Airway, C-spine, and LOC Assessment
Airway: Patent, maintainable, un-maintainable Level of consciousness, altered mental status Skin appearance: Ashen, pale, gray, cyanotic, or mottled Facial fractures, head fractures, C-spine step-off Airway clearance Sounds of obstruction Glasgow coma scale, AVPU

Summary of Primary Disability (Neurological) Assessment			
A.V.P.U.	**Glasgow Coma Scale (GCS)**		
A - Alert **V - Responds to verbal stimuli** **P - Responds to painful stimuli** **U - Unresponsive**	Eye Opening:	Spontaneous To voice To pain No response	4 3 2 1
	Verbal Response:	Oriented Confused Inappropriate words Incomprehensible No response	5 4 3 2 1
	Motor Response:	Obeys commands Localizes (pain) Withdraws (pain) Flexion (pain) Extension (pain) No response	6 5 4 3 2 1

Summary of Primary -- Breathing Assessment
Rate and depth of respirations
Cyanosis
Position of the trachea
Presence of obvious injury or deformity
Work of breathing
Use of accessory muscles
Flaring of nostrils
Presence of bilateral breath sounds
Asymmetric chest movements
Palpation of crepitus
Integrity of chest wall

B. BREATHING:

Once the airway is assessed and managed, a quick assessment of the patient's breathing should be performed. If weather permits, and a chest injury is suspected, exposing the chest is prudent. With a stethoscope in one hand, wrap both hands around the patient's chest high along the mid-axillary line, then repeat on the other side. This allows you to assess for the presence or absence of breath sounds and to feel for equal expansion, crepitus and / or flail segments while visualizing for any injuries. Treatments that may be initiated here include high-flow oxygen, manual ventilations, sealing penetrating chest wounds and decompressing a suspected tension pneumothorax.

C. CIRCULATION:

Summary of Primary Circulation Assessment
Pulse rate and quality
Skin appearance: Color
Peripheral pulses
Skin temperature
Level of consciousness
Open wounds
Arterial and/ or venous hemorrhage

RAPID TRAUMA ASSESSMENT:

A rapid trauma assessment is indicated for any patient whose MOI involves environmental factors (burns, drowning, toxic inhalation, etc), motion, or the transfer of a significant amount of energy to that patient (motor vehicle collisions, projectile penetrations, rapid deceleration, etc). As the primary assessment is meant to look for injuries and conditions that may be fatal in minutes, the rapid trauma assessment looks for injuries or conditions that are more subtle or may not be evident for a longer period (15 - 30 minutes).

As others are preparing for the extrication, do a very rapid trauma assessment looking for gross injuries that may pose a problem during extrication, such as multiple long bone or pelvic fractures that may cause pain, further injury and hemorrhage if care is not taken

when moving the patient from the vehicle to a backboard. Although this maneuver is "*rapid*" it does not allow for compromise of the cervical spine. Cervical spine injuries should be considered in all trauma patients until they can be ruled out by appropriate medical personnel. A stiff cervical collar, backboard, spider straps, head blocks, and tape, or an appropriate substitution as the need or situation arises, should be used to protect the cervical spine during transport. Neurological assessments of all extremities should be performed and documented before and after all immobilization.

To properly perform the rapid trauma assessment, the patient must be fully exposed. Do not feel guilty about cutting away obtrusive clothing if there is a high index of suspicion for injuries based upon the mechanism; however, take into account when and where you expose the patient. If there is a large crowd, maintain the patient's modesty by exposing only what is vital to the assessment and treatment and / or shielding the patient from the crowd with sheets or tarps. Also consider body temperature during exposure, as patients rapidly lose body heat through convection and radiation to the surrounding environment. No matter the temperature outside, always cover the patient with sheets or blankets and consider turning the air-conditioning down, or off, in the ambulance, as cold blood is less likely to clot and trauma patients are more prone to hypothermia.

If any serious conditions are found during the rapid trauma assessment, stabilize the patient as soon as possible, but determine to what extent. Look at the patient's overall condition and perform a risk-benefit analysis to determine if the proposed treatment would make a difference in the outcome versus how long it would take to accomplish that treatment considering the patient's other injuries. Also consider whether the desired treatment could be done safely enroute to the intended receiving facility.

Always be aware of the time you are spending on scene or on a particular task and be ready to transport if the patient's condition changes. Transport to the closest hospital is always warranted if you are unable to obtain or maintain an airway. Notify the hospital of the airway problem so they can have the appropriate equipment, medications, and personnel in place prior to the patient's arrival.

SECONDARY ASSESSMENT:
Typically, the secondary assessment begins once any life threats to the patient's airway, breathing, and circulation have been managed and any major injuries are stabilized. In a trauma situation, parts of the secondary assessment may occur simultaneously with other assessments, but should never interfere with them. The ability to do this is directly dependent upon the number of people available and the space within which providers have to work.

VITAL SIGNS:
When and where you obtain vital signs is directly related to the severity of the patient's condition, the number of responders on the scene, and available access to the patient. Vital signs are commonly left until the patient is in the ambulance and all critical and essential treatment has been established. Occasionally, when there are enough responders, one person may be delegated to obtain vital signs, but remember that this should not delay transport.

Vital sign trending is the practice of continually retaking vital signs to identify changes in patient condition. In the trauma patient, this occurs minimally every five minutes, or whenever the patient's condition changes. Trending will help to determine patient stability and alert providers to impending problems.

ONGOING ASSESSMENT:
The ongoing assessment involves continual reassessment of the patient any time his or her condition changes; an intervention is performed; or after any movement. Regularly reassess the patient's ABCs. Assessing mental status, performing baseline and repeat Glasgow Coma Scale scoring, and checking / rechecking the pupils will help determine any changes in the patient's neurologic status. Constant assessment of neurovascular status will alert you to developing paralysis, shock or a splint that is improperly applied. Subjective information such as asking the patient if s/he is feeling better or worse should be included. And finally, reassessing after interventions is important and may include effectiveness and tightness of splints, patency and flow rates of intravenous lines, and confirmation of endotracheal tube placement.

TRAUMA PATIENT ASSESSMENT

Summary of Secondary Assessment	
Skin	• Presence of petechia, purpura, abrasions, bruises, scars, or birthmarks • Lacerations, uncontrolled hemorrhage • Rashes • Abnormal skin turgor • Signs of abuse or neglect
Head and Neck	• Presence of lacerations, contusions, raccoon eyes, • Battle's sign, or drainage from the nose, mouth, and / or ears • Gross visual examination • Abnormal extra-ocular movements • Position of the trachea • Neck veins • Swallowing difficulties • Nuchal rigidity • Presence of lymphadenopathy or neck masses • Vertebral step-off
Ears, Nose, and Throat	• Hemorrhage • Drainage • Sunken eyes • Gross assessment of the hearing • Obstruction • Foreign body
Mouth and Throat	• Mucous membranes • Drooling • Breath odor • Drainage • Injuries to teeth • Airway obstruction
Thorax, Lungs, and Cardiovascular System	• Breath sounds • Open Pneumothorax • Crepitus • Paradoxical motion • Heart Sounds
Abdomen	• Shape and size • Bowel sounds • Tenderness • Rigidity • Evisceration • Masses (i.e. suprapubic masses) • Pelvic tenderness, crepitus, or instability

Genitourinary	• Rectal bleeding • Color of urine
Extremities and Back	• Gross motor and sensory function • Peripheral pulses • Lack of use of an extremity • Deformity, angulation • Wounds, abrasions • Vertebral column, flank, buttocks • Equipment is appropriately applied (i.e. traction splints, extremity splints, cervical collar)

Assessment Acronyms

S.A.M.P.L.E.		O.P.Q.R.S.T.		
S	Signs and Symptoms	**O**	Onset	(When did the problem / pain begin?)
A	Allergies	**P**	Provocation	(What makes the problem / pain worse?)
M	Medications	**Q**	Quality	(Can you describe the problem / pain?)
P	Pertinent past medical history	**R**	Radiation	(Does the pain move anywhere?)
L	Last oral intake	**S**	Severity	(On a scale of 1 - 10, how bad is the pain?)
E	Events leading up to the event	**T**	Time	(Does the condition come and go? Duration?)

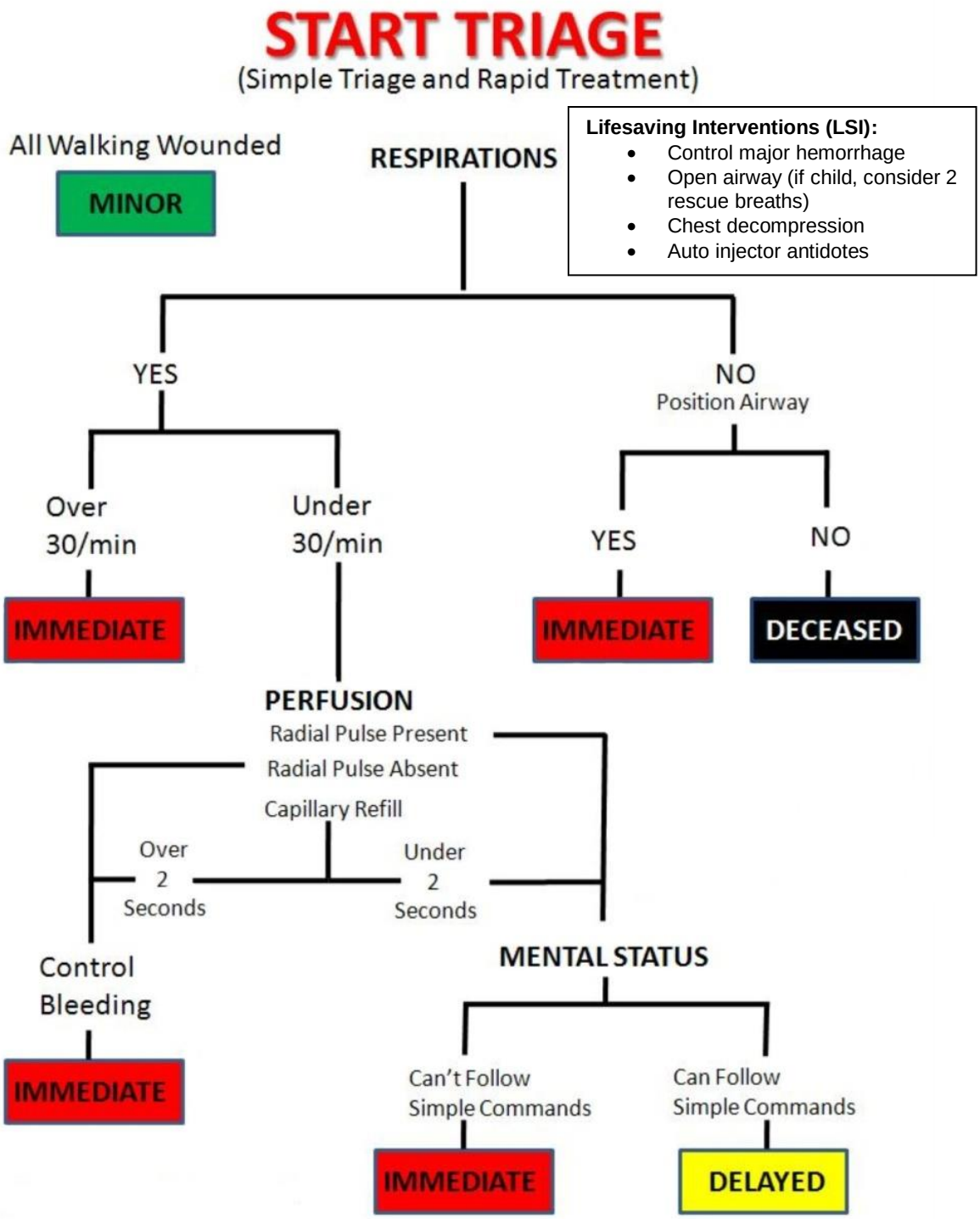
T.I.C.S.		D.C.A.P. / B.T.L.S.			
T	Tracks, tags, tattoos	**D**	Deformities	**B**	Burns
I	Instability	**C**	Contusions	**T**	Tenderness
C	Crepitus	**A**	Abrasions	**L**	Lacerations
S	Scars	**P**	Punctures	**S**	Swelling

Protocol

4-1

Continued

TRAUMA PATIENT ASSESSMENT



Protocol
4-2

SECTION: Adult Trauma Emergencies

PROTOCOL TITLE: Injury – Abdominal Trauma
(Abdominal Trauma)

REVISED: 06/2017

ABDOMINAL TRAUMA

OVERVIEW:
Blunt and penetrating traumas are major causes of morbidity and mortality in the United States. In blunt force abdominal trauma, the spleen and liver are typically the most commonly injured organs, and in penetrating trauma, there is a slightly higher mortality, depending on the mechanism of injury. Gunshot and stab wounds combine to make up the largest percentage of penetrating abdominal injuries. When performing a focused abdominal assessment, be organized, efficient, and thorough. Initial abdominal examinations only identify injury about half the time; secondary exams are needed when there is a high index of suspicion for abdominal trauma. A proper abdominal examination involves exposing the entire abdomen from the nipple line to the groin and using a standard examination sequence of inspection, auscultation, percussion, and palpation.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism: blunt/ penetrating • Loss of consciousness • Damage to structure, vehicle • Location in structure or vehicle • Speed details of MVC • Restraints, protective devices • Medical history • Medications • Evidence of multi-system trauma	• Pain, swelling, bleeding • Deformity, lesions • Altered mental status, unconsciousness • Respiratory distress, failure • Hypotension, shock • Arrest • Significant mechanism of injury	• Intra-abdominal bleeding • Pelvis fracture • Abuse

	EMR	EMT	A	I	P
1. Maintain scene and provider safety.	•	•	•	•	•
2. Perform general patient management.	•	•	•	•	•
3. Administer supplemental oxygen to maintain a *SPO_2* 94 - 99%. If needed assist ventilations with BVM but avoid hyperventilation, maintain C-spine precautions.	•	•	•	•	•
4. Identify mechanism of injury.	•	•	•	•	•
5. Establish large bore IV's of normal saline. Titrate to systolic blood pressure of 90 to 100 mmHg.			•	•	•

ABDOMINAL TRAUMA

	EMR	EMT	A	I	P
6. Treat pain if indicated. Refer to *General – Pain Control* protocol.			•	•	•
7. Consider *ONDANSETRON (ZOFRAN)* 0.1 mg / kg slow IVP over 2 - 5 minutes, max 4.0 mg per dose as needed per *Medical – Nausea/Vomiting* protocol. ***Do not give PO meds.***			•	•	•
8. Transport to the appropriate hospital per *Field Trauma Triage Scheme.*		•	•	•	•
9. Reassess patient as indicated.	•	•	•	•	•

Impaled objects
Stabilize impaled objects in place with bulky dressings.

Severe hemorrhage from open penetrating injury
Control bleeding with well-aimed direct pressure directly on the bleeding source. Once controlled, apply dry, sterile dressing.

Evisceration with protruding abdominal contents
Loosely wrap any protruding abdominal contents with a sterile dressing moistened with warm (if available) Normal Saline and cover in entirety with an occlusive dressing.

PEARLS

1. The amount of external bleeding is not an indicator of the potential severity of internal bleeding associated with an underlying trauma.
2. Avoid overly aggressive fluid administration; provide fluid boluses to maintain systolic BP between 90 – 100 mmHg; alternatively, a mean arterial pressure of 65 mmHg is equally desirable. MAP is approximately equal to:

   Diastolic BP + 1/3 (Systolic BP - Diastolic BP)

3. Abdominal eviscerations are a surgical emergency. The protruding organ requires careful cleaning and evaluation prior to reinsertion. Do not attempt to reinsert the organs in the pre-hospital setting.
4. Impaled objects in the abdomen often tamponade internal hemorrhage, and removing them may trigger significant internal bleeding. Remember that any bump against the object moves the distal end in the organ and may worsen damage.
5. Pain management is an essential component to good trauma care. Simple pain management techniques include oxygen administration, splinting, speaking in calm, reassuring voice, and placing the patient in his or her position of comfort. When spinal immobilization is required, flexing the patient's knees toward the chest helps relax the abdominal muscles.

SECTION: Adult Trauma Emergencies

PROTOCOL TITLE: Injury – Burns - Thermal

REVISED: 06/2016

Protocol
4-3

BURNS

OVERVIEW:
Burns are a devastating form of trauma associated with high mortality rates, lengthy rehabilitation, cosmetic disfigurement, and permanent physical disabilities. Thermal, chemical, electrical, nuclear radiation or solar sources may cause burns. Burns can affect more than just the skin. They can affect the body's fluid and chemical balance, temperature regulation, and musculoskeletal, circulatory, and respiratory functions. Burns are classified by degree, 1° (superficial) some reddening to skin, 2° (partial thickness) has blistering and deep reddening to the skin, and 3° (full thickness) causes damage to all skin layers and is either charred/ black or white/ leathery with little or no pain at the site. The patient's palm equals 1% of body surface area when determining the area affected. This is sometimes more helpful than using the "rule of nines" especially with pediatric patients.

HPI	Signs and Symptoms	Considerations
• Type of exposure (heat, gas, chemical) • Inhalation injury • Time of injury • Past medical history • Medications • Other trauma	• Burns, pain, swelling • Dizziness • Loss of consciousness • Hypotension/ shock • Airway compromise, distress • Singed facial or nasal hair • Hoarseness, wheezing	• Chemical • Thermal • Radiation • Electrical

	EMR	EMT	A	I	P
1. Stop the burning process	•	•	•	•	•
a. Thermal burns: Irrigate the burned area with sterile water or saline to cool skin. Do not attempt to wipe off semisolids (grease, tar, wax, etc.). Do not apply ice. Dry the body when the burn area is greater than or equal to 10% TBSA to prevent hypothermia.	•	•	•	•	•
b. Dry chemical burns: Brush off dry powder, then lavage with copious amounts of tepid water (sterile, if possible) for 20 minutes. Continue en route to the hospital.	•	•	•	•	•
c. Liquid chemical burns: Irrigate the burned area with copious amounts of tepid water (sterile, if possible) for 20 minutes. Continue en route to the hospital.	•	•	•	•	•
2. Perform general patient management.	•	•	•	•	•

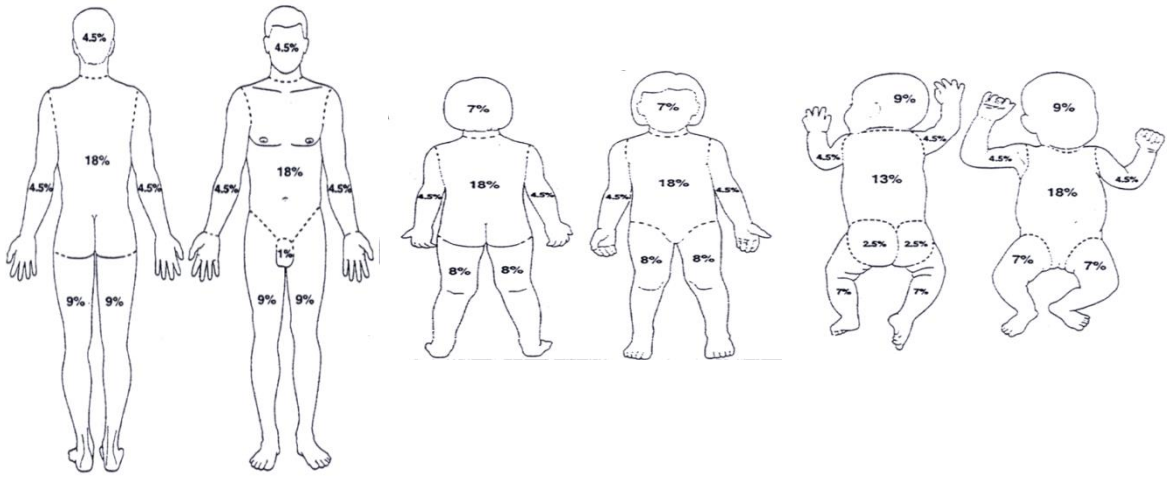
Protocol 4-3

Continued

BURNS

	EMR	EMT	A	I	P
3. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
4. Administer oxygen to maintain SPO_2 94-99%	•	•	•	•	•
5. If the patient is in critical respiratory distress or impending respiratory failure, consider placement of **orotracheal** intubation.				•	•
6. Remove clothing from around burned area, but do not remove/peel off skin or tissue. Remove and secure all jewelry and tight fitting clothing.	•	•	•	•	•
7. Assess the extent of the second/third degree burn (BSA). If more than 20% (2nd and 3rd) BSA, establish IV and administer NS • If patient is less than 5 years of age, infuse 125mL/hr • If patient is 5-14 years of age, infuse 250 mL/hr • If patient is greater than 14 years of age, infuse 500mL/hr.			•	•	•
8. Cover the burned area with a clean, dry dressing. Wet dressing may be used if the burned TBSA is less than 10%.	•	•	•	•	•
9. For pain control, refer to *Pain Management Protocol.*				•	•
10. Maintain body temperature and reassess patient	•	•	•	•	•
11. Transport to closest appropriate facility. See BURN UNIT REFERRAL CHART		•	•	•	•

***Normal Saline or Lactated Ringers are fluids of choice in burn patients. ***



American Burn Association - BURN UNIT REFERRAL CRITERIA

- Partial thickness and full thickness burns greater than 10% of the total body surface area (TBSA) in patients under 10 or over 50 years of age.
- Partial thickness burns and full thickness burns greater than 20% TBSA in other age groups.
- Partial thickness and full-thickness burns involving the face, eyes, ears, hands, feet, genitalia or perineum or those that involve skin overlying major joints.
- Full-thickness burns greater than 5% BSA in any age group.
- Electrical burns, including lightning injuries; (significant volumes of tissue beneath the surface may be injured and result in acute renal failure and other complications).
- Significant chemical burns.
- Inhalation injuries.
- Burn injury in patients with pre-existing illness that could complicate management, prolongs recovery, or affects mortality.
- Any burn patient in whom concomitant trauma poses an increased risk of morbidity or mortality may be treated initially in a trauma center until stable before transfer to a burn center.
- Children with burns seen in hospitals without qualified personnel or equipment for their care should be transferred to a burn center with these capabilities.
- Burn injury in patients who will require special social and emotional or long term rehabilitative support, including cases involving child abuse and neglect.

Classification of Burn Severity

Critical Burns:

- All burns complicated by injuries of the respiratory tract, other soft-tissue injuries, and injuries of the bones.
- Partial-thickness or full-thickness burns involving the face, hands, feet, genitalia, or respiratory tract.
- Full-thickness burns of more than 10% *(Less than 5 years of age: any extent).*
- Partial-thickness burns of more than 30% *(Less than 5 years of age: greater than 20%).*
- Burns complicated by musculoskeletal injuries.
- Circumferential burns.

Moderate Burns:

- Full-thickness burns of 2% to 10%, excluding face, hands, feet, genitalia, or respiratory tract.
- Partial-thickness burns of 15% to 30% *(Less than 5 years of age: 10% to 20%).*
- Superficial burns that involve more than 50%.

Minor Burns:

- Full-thickness burns of less than 2%, excluding face, hands, feet, genitalia, or respiratory tract.
- Partial-thickness burns of less than 15% *(Less than 5 years of age: less than 10%)*
- Superficial burns of less than 50%.

BURNS

PEARLS

1. The **Parkland formula** is *no longer* recommended in the prehospital setting. Over resuscitation with fluid causes problems for patients.
2. Remove patient's clothing as appropriate. Remove rings, bracelets and other constricting items in areas of burn, if possible.
3. Critical burns: burns over > 25% TBSA; 2° burns > 10% TBSA; 2° and 3° burns to the face, eyes, hands, or feet; electrical burns; respiratory burns; deep chemical burns; burns with extremes of age or chronic disease; and burns with associated major traumatic injury. These patients should be transported directly to VCU Health Systems, if possible.
4. Have a high index of suspicion and a low intubation threshold when treating burn patients with possible airway involvement. Early intubation is recommended in significant inhalation injuries.
5. Circumferential burns to extremities are dangerous due to potential vascular compromise secondary to soft tissue swelling.
6. Burn patients are prone to hypothermia; never cool burns that involve > 10% TBSA, however, ensure the burning process has thoroughly ceased (ie. tar, asphalt).
7. Never overlook the possibility of multi-system trauma.
8. Burns are extremely painful. Strongly consider pain management medications as needed.
9. Do not apply burn creams or gels, such as Silvadene. If it was applied prior to the arrival of EMS, leave in place.

SECTION: Adult Trauma Emergencies

PROTOCOL TITLE: Injury – Crush Syndrome

REVISED: 01/2019

Protocol
4-4

CRUSH INJURIES

OVERVIEW:
Crush injuries can result from a variety of mechanisms including mine cave-ins, trench collapses, building collapse, vehicular collisions or industrial accidents. Also called traumatic rhabdomyolysis, it is defined as the prolonged compression, usually 4 - 6 hours but possibly less than 1 hour, of large muscle mass and compromised local circulation. Crush syndrome may also be exacerbated by hypovolemia secondary to hemorrhage. Compression on the body causes a disruption in tissue perfusion to a muscle group leading to cellular hypoperfusion and hypoxia. Cellular perfusion is further decreased due to hemorrhage from torn or compressed vessels. Once the compressive force is relieved, blood flow resumes, releasing the toxic substances that have been collecting in the compressed areas into the systemic circulation. This can result in systemic metabolic acidosis, widespread vasodilation, and hyperkalemia. Metabolic acidosis and high potassium levels could have deleterious effects on the myocardium and lead to patient death. Cardiac arrest due to hyperkalemia typically occurs within the first hour of removal from compression. Because of this, treatment for crush injuries begins prior to patient removal from compression.

HPI	Signs and Symptoms	Considerations
• Entrapment of one or more extremities and/ or trunk • Time entrapped • Medical history • Allergies • Heart Failure	• Obvious crushing of a muscle mass (arm, leg, etc.)	• Extremity fracture • Paralysis, Spinal cord injury • Compartment syndrome

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems.	•	•	•	•	•
3. Administer oxygen to maintain a *SPO_2* between 94 - 99%. Support respirations as necessary with a BVM.	•	•	•	•	•
4. Consider activation of local and / or regional technical rescue team.	•	•	•	•	•
5. Start an IV of normal saline and administer normal saline 20 cc / kg bolus, prior to extrication if possible. Maintain perfusion by following the *Medical – Hypotension/Shock* protocol. ***DO NOT USE LACTATED RINGERS.***			•	•	•
6. Apply and tighten *tourniquet* on entrapped/crushed extremity *BEFORE* extrication.		•	•	•	•

CRUSH INJURIES

	EMR	EMT	A	I	P
7. Attach ECG monitor. Obtain / interpret *12 Lead ECG.* Carefully monitor for dysrhythmias before, immediately after release of pressure and during transport (i.e., peaked T waves, wide QRS, lengthening QT interval, loss of P wave). Contact Medical Control if hyperkalemia is suspected.**				•	•
8. Transport as soon as possible.		•	•	•	•
9. For pain control, consider analgesics a. *FENTANYL* 1 mcg / kg IV / IM, not to exceed 100 mcg single dose. Repeat dose in 10 minutes if necessary. Max total dose is 200 mcg. b. If Fentanyl is unavailable, give *MORPHINE* 0.1 mg / kg IV at 1 mg / min, not to exceed 5 mg single dose with max total dose of 20 mg. If no IV established, administer *MORPHINE* 0.1 mg / kg IM, not to exceed 10 mg (1.0 mL); repeat IM dose in 10 minutes if necessary.			•	•	•
10. Consider the following options:					
a. Continued boluses of normal saline.			•	•	•
b. For 1 limb greater than 2 hour or 2 limbs greater than 1 hour , administer *SODIUM BICARBONATE* 1 mEq / kg IV bolus over 2 minutes. Consider administration of bicarb containing IV solution (One liter of D_5W with 2 amps bicarb infused at 150 cc / hour).				•	•
c. If ECG suggestive of hyperkalemia,** consider *ALBUTEROL* 5.0 mg via small volume nebulizer.				•	•
d. If ECG suggestive of hyperkalemia, consider *CALCIUM CHLORIDE* 8 mg / kg of 10% solution IV over 5 minutes.				•	•
11. Transport and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

1. A patient with a crush injury may initially present with very few signs and symptoms. A high index of suspicion should be maintained for any patient with a compressive mechanism of injury.
2. Elevated potassium levels have an increased risk of affecting the myocardium resulting in ventricular tachycardia and ventricular fibrillation.
3. Suspect hyperkalemia if T-waves become peaked, QRS becomes prolonged (> 0.12 seconds), absent P wave, or prolonged QTc**.
4. If a possible field amputation is anticipated, contact Medical Control for guidance.
5. Sodium Bicarbonate will keep the urine alkalotic and assist in preventing acute renal failure.
6. Tourniquets should be applied above the crush.

*****Suggestive signs of Hyperkalemia:***

- *Peaked T waves in V1 and V2*
- *Widened QRS (> 0.12 seconds)*
- *QTc > 500*

If any of these findings are noted on a 12 lead: Contact Medical Control

This page intentionally
left blank.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury – Electrical Injuries

REVISED: 06/2017

Protocol
4-5

ELECTRICAL INJURIES

OVERVIEW:
Before treating any patient with an electrical injury, ensure your personal safety. Do not touch the patient if the patient is still in contact with the electrical source. The vast majority of electrical injuries are caused by generated electricity, such as that encountered in power lines and household outlets. Relative to the external damage caused by electrical injuries, internal damage is often more severe, and can include damage to muscles, blood vessels, organs, and nerves. Damaged muscle releases myoglobin which can cause acute renal failure. Electrical current as low as 20 mA can cause respiratory arrest and as little as 50 mA can cause ventricular fibrillation. Although long-bone fractures and spinal injuries can occur due to falls after electrocution, they can additionally occur due to severe tetanic muscle spasms with high amplitude electrocutions.

HPI	Signs and Symptoms	Considerations
• Lightning or electrical exposure • Single or multiple victims • Trauma secondary to fall from high wire or MVC into line • Duration of exposure • Voltage and current (AC / DC)	• Burns • Pain • Entry and exit wounds • Hypotension and shock • Cardiac and/ or respiratory arrest	• Cardiac arrest • Respiratory arrest • Seizure • Burns • Multisystem trauma

	EMR	EMT	A	I	P
1. Perform general patient management. Do not touch the patient if they are in contact with the electrical source.	•	•	•	•	•
2. Support life-threatening problems.	•	•	•	•	•
3. Administer oxygen to maintain *SPO_2* 94 - 99%. Consider supporting respirations with a BVM.	•	•	•	•	•
4. Determine extent of any burn injuries. Refer to the *Injury – Burns – Thermal* protocol. Avoid initiating IVs in areas of burn unless absolutely necessary.		•	•	•	•
5. Place patient on cardiac monitor; obtain *12 Lead ECG*.		•	•	•	•
6. Interpret ECG. Refer to the appropriate *Cardiac Care protocol* for dysrhythmias. If hyperkalemia is suspected, contact Medical Control.				•	•
7. Establish an IV of normal saline at KVO.			•	•	•
8. Consider administration of pain management per *General – Pain Control* protocol.			•	•	•

9. Transport to a trauma facility and perform ongoing assessment as indicated.

The cutaneous system is typically involved in electrocution. Importantly, the initial size of the burn site is not an accurate reflection of the amount of tissue actually involved because the subcutaneous tissue is commonly involved. Therefore, the rule of nines should not be used for calculating fluid resuscitation. Instead, adequate tissue perfusions, vital signs, and urine output should guide fluid resuscitation.

An electrical injury should be treated more like a crush injury rather than a thermal injury. Fluid resuscitation should begin as soon as possible to maintain a urinary output of 0.5 to 1 mL / kg / hr.

MedScape: Electrical Injuries

Jorge A. Martinez, MD, JD, Thai Nguyen, MD

Posted: 12/01/2000; South Med J. 2000;93(12) © 2000 Lippincott Williams & Wilkins

PEARLS:

1. Ventricular fibrillation and asystole are the common presenting dysrhythmias associated with electrical injuries.
2. Injuries are often hidden. The most severe injuries will occur internally in the muscles, vessels, organs, and nerves.
3. If the victim did not arrest initially, the probability of ROSC and survivability can be higher in lightning strike injuries.
4. Do not overlook other trauma (i.e., falls).
5. Lightning is a massive DC shock most often leading to asystole as a dysrhythmia.
6. In lightning injuries, most of the current will travel over the body surface producing flash burns over the body that appears as freckles.
7. Do not overlook the possibility of spinal injuries or long bone fractures associated with lightning strikes, primarily the cause of trauma or tetanic muscle contractions.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury – Head

REVISED: 06/2017

Protocol
4-6

HEAD INJURY

OVERVIEW:
Brain injury and its accompanying pathologic processes continue to be a leading cause of mortality associated with trauma. Whether the injury is due to a blunt or penetrating mechanism, bleeding or swelling of the brain and surrounding tissue may lead to an increase in pressure within the cranial cavity, known as intracranial pressure (ICP). If pressure within the skull is not controlled, neurologic changes may produce signs and symptoms ranging from headache to coma with loss of protective reflexes. Blunt force trauma may result in scalp injury, skull fracture, and meningeal and brain tissue injury. Penetrating trauma may produce focal or diffuse injury, depending on the velocity of the penetrating object. Although the pre-hospital provider cannot reverse the brain tissue damage from the initial/ primary brain injury that has already occurred, they can play a major role in preventing or limiting the processes that exacerbate and lead to a secondary brain injury. The pre-hospital provider's goal is to focus on reversing any hypoxia, hypotension, hypercarbia, acidosis, or increasing intracranial pressure.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism: blunt vs penetrating • Loss of consciousness • Bleeding • Medical history • Medications • Evidence of multi-system trauma	• Pain, swelling, bleeding • Altered mental status, unconsciousness • Respiratory distress, failure • Cushing's reflex triad • Cheyne-Stokes and Biot's respirations • Unequal, dilated, sluggish pupil(s) • Vomiting • Significant mechanism of injury	• Skull fracture • Brain injury (concussion, contusion, hemorrhage, laceration) • Epidural hematoma • Subdural hematoma • Subarachnoid hemorrhage • Spinal injury • Falls • Seizure disorder • Abuse

	EMR	EMT	A	I	P
1. Perform general patient management .	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
3. Administer oxygen to maintain *SPO_2* 94 - 99%. Consider supporting respirations with a BVM.	•	•	•	•	•
4. Assess patient and mechanism of injury to determine need for Spinal Motion Restriction (4.13)	•	•	•	•	•
a. If patient requires SMR, assess and document PMS in all extremities before and after movement.	•	•	•	•	•

HEAD INJURY

	EMR	EMT	A	I	P
5. Obtain and document baseline GCS and reassessments.		•	•	•	•
6. Monitor *capnography*, if available. Attempt to maintain between 35 - 45 mm Hg.			•	•	•
7. Place patient on cardiac monitor.				•	•
8. Establish an IV of normal saline at KVO. If time permits, establish an additional line.			•	•	•
9. Obtain a blood glucose sample.		•	•	•	•
10. If patient is exhibiting signs of shock, refer to *Shock protocol.*	•	•	•	•	•
11. Transport and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

1. Hyperventilation is not recommended for head-injury patients who do not have symptoms of herniation syndrome, as auto-regulatory mechanisms are intact and hyperventilation may worsen cerebral perfusion pressure.
2. One of the most important indicators of worsening head injury is a change in LOC and/or GCS.
3. Increased ICP may cause hypertension and bradycardia (Cushing's response).
4. Hypotension usually indicates injury or shock unrelated to the head injury and should be treated aggressively to maintain adequate cerebral perfusion.
5. Supine positioning may also increase ICP transiently.
6. Ensure that neck collars are not too tight as to restrict venous drainage.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Exposure – Airway/Inhalation Irritants

REVISED: 06/2017

Protocol
4-7

INHALATION INJURY

OVERVIEW:
A majority of fire related deaths are the result of smoke inhalation. Suspect inhalation injury and respiratory damage in any victim of a thermal burn, particularly if the patient has facial burns, singed nasal hair, carbonaceous sputum or was in an enclosed space. Be aware that many chemicals are present during ordinary combustion including Hydrogen Sulfide, Hydrogen Cyanide and Carbon Monoxide (CO). CO is a tasteless, odorless, colorless, and non-irritating gas. Almost any flame or combustion device can produce the gas. CO poisoning is a common problem and produces a broad spectrum of signs and symptoms, often imitating the flu. Think about CO poisoning when multiple patients present with the same signs and symptoms at a residence.

Hydrogen cyanide is a by-product of the combustion of materials used in everyday life products (i.e., insulation, carpets, clothing, and synthetics). The culprit is nitrogen. Nitrogen gas in atmospheric air can contribute (under the right circumstances) to the formation of minute amounts of cyanide during combustion. High temperatures and low-oxygen concentrations favor the formation of cyanide gas. Smoke from the combustion of grass clippings, green wood, tobacco, cotton, paper, wool, silk, weeds, and animal carcasses will likely contain some hydrogen cyanide gas. But the real offender is the combustion of manmade plastic and resins containing nitrogen, especially if the fire is hot and in an enclosed space. Common manmade materials that generate cyanide gas during combustion include nylon, polyurethane, melamine, and acrylonitrile.[1]

HPI	Signs and Symptoms	Considerations
• Type of exposure (heat, gas, chemical) • Inhalation injury • Time of injury • Past medical history • Medications • Other trauma	• Burns, pain, swelling • Dizziness • Loss of consciousness • Hypotension/ shock • Airway compromise, distress • Singed facial or nasal hair • Hoarseness, wheezing	• Electrical • Chemical • Thermal • Radiation

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•

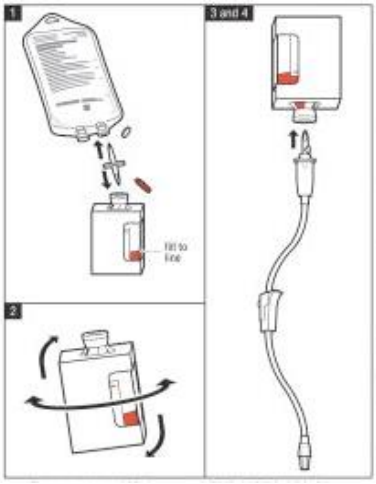
[1] www.fireengineering.com: Hydrogen Cyanide: New Concerns for Firefighting and Medical Tactics. Posted 06/29/2009. Author: Richard Rochford

Protocol 4-7

Continued

INHALATION INJURY

	EMR	EMT	A	I	P
3. Administer oxygen by NRBM or support respirations with a BVM as indicated (SPO_2 is often unreliable for these patients).	•	•	•	•	•
4. Consider *orotracheal intubation* for impending respiratory failure.				•	•
5. Monitor *capnography*, if available. Maintain a range between 35 - 45 Torr.			•	•	•
6. Place patient on cardiac monitor and obtain/interpret *12 lead ECG*. Refer to appropriate *Cardiac Care protocol.*		•	•	•	•
7. Establish an IV of normal saline at KVO.			•	•	•
8. If available, consider *CPAP* with 5 - 10 cm H_20 PEEP.		•	•	•	•
9. Transport to Burn Center and perform ongoing assessment as indicated.		•	•	•	•
10. If carbon monoxide is suspected or confirmed, administer O_2 with non-rebreather mask.	•	•	•	•	•
11. If cyanide is suspected or confirmed, and kit is available, administer Cyanokit®. ***See administration instructions.*				•	•

****Cyanokit® Infusion[2]**	
Mix and administer Cyanokit® infusion:	
1. Add **200 ml of Normal Saline injection to Hydroxocobalamin 5g vial** using supplied transfer spike. 2. Fill to line on bottle with vial in upright position. 3. Rock or rotate vial for 60 seconds to mix solution. Do not shake. 4. Attach included vented IV tubing. **Infuse over 15 minutes**. 5. Total amount infused should be documented as 5g.	

PEARLS:

2 http://www.cyanokit.com/pdf/Two%202.5g%20Vials%20Administration%20Guide%20101611.pdf

1. Pulse oximetry may give falsely elevated readings in patients with methemoglobin or CO / CN exposure.
2. Hyperbaric therapy can be indicated for some carbon monoxide poisonings; especially in early pregnancy and patients with failing vital signs. For fire related exposures, transport to the burn center at VCU Health System. For non-fire related CO exposures, contact Medical Control for guidance. Hyperbaric chambers are located at Chippenham Hospital, Southside Regional Medical Center, Retreat Doctor's Hospital, University of Virginia Medical Center.
3. Critical burns: burns over > 25% TBSA; 2° burns > 10% TBSA; 2° and 3° burns to the face, eyes, hands, or feet; electrical burns; respiratory burns; deep chemical burns; burns with extremes of age or chronic disease; and burns with associated major traumatic injury. These patients should be transferred directly to a burn center.
4. Have a high index of suspicion and a low intubation threshold when treating burn patients with possible airway involvement. Early intubation should be considered in significant inhalation injuries.
5. Burn patients are prone to hypothermia – never cool burns that involve > 15% TBSA.
6. Never overlook the possibility of multi-system trauma.

This page intentionally
left blank.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury – Sexual Assault

REVISED: 06/2017

Protocol
4-8

SEXUAL ASSAULT

OVERVIEW:
A patient that has experienced the trauma of sexual abuse may present in a variety of ways. Physical trauma may be evident along with emotional trauma, which is very prevalent in these situations. In other cases, emotional trauma may be the only presenting problem. Pre-hospital EMS providers may be thrust into the role of mediator, buffer, or confidant. They may even be subject to violent aggression on the part of the victims or their families. Injuries associated with sexual assault may vary widely. They can be as subtle as slight pain or discomfort or as grossly evident as either debilitating or disfiguring trauma. The victim's injuries also may not be obvious or visible on first inspection; some may even deny injuries and relay untruthful information regarding the occurrence. The pre-hospital provider must develop and foster rapport with the victim to gain the victim's confidence, so that accurate information can be obtained.

HPI	Signs and Symptoms	Considerations
• Type of injury • Mechanism: rape, sodomy, sexual abuse • Timeline of incidents • Medical history • Medications	• Physical injuries • Emotional injuries • Recurring injuries • Withdrawal, hostility	• Emotional trauma • Behavioral disorder • Traumatic injury

	EMR	EMT	A	I	P
1. Obtain general patient assessment.	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
3. Assess for signs of trauma; take C-spine precautions per assessment.	•	•	•	•	•
4. Administer Oxygen to maintain *SPO_2* 94 - 99%	•	•	•	•	•
5. Perform wound care only to assess the severity and provide hemorrhage control.	•	•	•	•	•
6. If an acute medical condition is noted, refer to appropriate *Medical Patient protocol*.	•	•	•	•	•
7. If physical trauma is noted, refer to appropriate *Trauma Patient protocol.*	•	•	•	•	•
8. Discourage the patient from changing clothes or bathing.	•	•	•	•	•
9. Transport promptly in position of comfort to appropriate facility. Reassess as needed.		•	•	•	•

PEARLS:

1. Use paper bags for all clothing and blood-stained articles, if available. If the patient's clothing is removed after leaving the scene, bag and label each item separately.
2. Do not ask questions about the patient's sexual history or practices, or questions that might make the patient feel guilty.
3. Do not examine the patient's genitalia unless there is severe injury, and then do so only with the patient's permission.
4. Maintain the crime scene and chain of evidence by turning over any transported items to forensic nursing staff at receiving facility, if available.
5. The receiving facility should be contacted prior to transport to notify of patient complaint and ascertain if forensic nursing (Sexual Assault Nurse Examiner - *SANE*) is available. EMS may be diverted due to lack of forensic capabilities.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: General – Neglect or Abuse Suspected

REVISED: 05/2016

Protocol
4-9

SUSPECTED ABUSE/NEGLECT

OVERVIEW:
Child and elder abuse, which includes sexual abuse, physical abuse, and neglect is often overlooked and under-reported. It is the ethical and legal responsibility to notify the receiving hospital of suspicions of child and elder abuse. It may prevent serious injury and death. Proof of abuse is not needed to make the report to hospital, CPS, APS, or social services. Patterns of abuse can reflect any form of physical and/ or mental trauma but are usually characterized by unexplained or poorly explained injuries of different ages and delay in seeking medical care. There are often no external signs of injuries. The provider should note vague medical symptoms such as repeated vomiting, abdominal pain, and distention in an elderly person with other evidence of abuse. Also be observant of decubitus ulcers, unsanitary conditions, skin conditions and the general nourishment of the elder. Observation, transport, and reporting are the key responsibilities of the pre-hospital provider.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism: blunt vs penetrating • Loss of consciousness • Bleeding • Past medical history • Medications • Evidence of multi-system trauma	• Pain, swelling, bruising, bleeding • Altered mental status, unconsciousness • Respiratory distress, failure • Dehydration • Fractures • Decubitus • Major traumatic mechanism of injury	• Skull fracture • Brain injury (concussion, contusion, hemorrhage, or laceration • Epidural hematoma • Subdural hematoma • Subarachnoid hemorrhage • Spinal injury

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems; C-spine precautions.	•	•	•	•	•
3. Administer oxygen, to maintain SPO_2 94-99% Support respirations as necessary with a BVM.	•	•	•	•	•
4. Observe and record objectively the surroundings and conditions of the scene and patient.	•	•	•	•	•
5. Refer to the appropriate *Medical or Trauma Patient Care protocol* for obvious injuries / illnesses.	•	•	•	•	•
6. UNDER VIRGINIA LAW, EMS PROVIDERS ARE MANDATORY REPORTERS OF SUSPECTED ELDER AND CHILD ABUSE. a. For children, notify the Emergency Department attending physician and Child Protective Services, if needed.	•	•	•	•	•

SUSPECTED ABUSE/NEGLECT

b. For adults, Adult Protective Services, or Social Services as appropriate					
7. Transport as soon as possible.		•	•	•	•

APS Hotline: 888-83-ADULT (888-832-3858)
CPS Hotline: 800-552-7096, 804-786-8536

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury – Conducted Electrical Weapons (i.e. Taser)

REVISED: 06/2017

Protocol 4-10

CONDUCTED ENERGY DEVICE INJURIES

OVERVIEW:
A conducted energy device is a non-lethal, battery-operated device that can deliver 50,000 volts of electricity in rapid pulses that stimulate the nerves in the body. This high-voltage, low-amperage electrical discharge overrides the body's muscle-triggering mechanisms causing neuromuscular incapacitation. This neuromuscular incapacitation overrides the patient's sensory and motor nerves of the peripheral nervous system by disrupting the electrical impulses sent by the brain to command skeletal muscle function.

HPI	Signs and Symptoms	Considerations
• Events leading to incident • Drug, ETOH ingestion • Medical history (especially cardiac) • Medications • Last tetanus	• Local injury • Altered mental status, unconsciousness • Respiratory distress • Chest pain • Cardiac, respiratory arrest	• Drug / ETOH ingestion • Cardiac rhythm disturbance • Myocardial infarction • Respiratory arrest • Cardiac arrest

	EMR	EMT	A	I	P
1. Perform general patient assessment.	•	•	•	•	•
2. Administer oxygen, to maintain *SPO_2* 94 - 99%. Support respirations as necessary with a BVM.	•	•	•	•	•
3. Determine history of events between the time the weapon was used until EMS arrived.	•	•	•	•	•
4. Per patient assessment (chest pain / palpitations) place patient on cardiac monitor and obtain / interpret *12 lead* ECG. Refer to appropriate *Cardiac Care protocol*.		•	•	•	•
5. Establish IV of Normal Saline at KVO rate, per assessment.			•	•	•
6. If patient is agitated or combative, refer to *Behavioral Emergencies protocol.*	•	•	•	•	•
7. Transport promptly in position of comfort and reassess as needed.		•	•	•	•

The current medical literature does not support routine performance of laboratory studies, electrocardiograms, or prolonged ED observation or hospitalization for ongoing cardiac monitoring after CEW exposure in an otherwise asymptomatic, awake and alert patient.

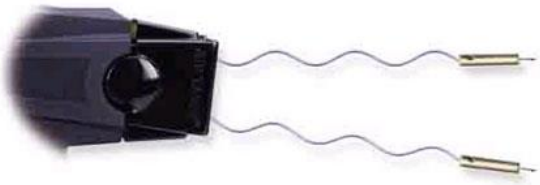
MedScape:
Emergency Department Evaluation After Conducted Energy Weapon Use
Review of the Literature for the Clinician
Gary M. Vilke, MD; William P. Bozeman, MD; Theodore C. Chan, MD

Protocol

4-10

Continued

CONDUCTED ENERGY DEVICE INJURIES



PEARLS:

1. If deployed by law enforcement, before touching any patient that has been subdued using a conducted energy device, ensure that the law enforcement officer has disconnected the deployment cartridge from the hand held unit.
2. If deployed by law enforcement, the probes and all connecting wires are considered evidence by law enforcement and should be maintained for collection.
3. Due to case reports of deaths associated with subjects subdued with these types of devices, all victims should be transported to the hospital for a thorough evaluation.
4. Encourage law enforcement to accompany patient, in ambulance, during transport to receiving facility.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury - Thoracic

REVISED: 06/2017

Protocol
4-11

THORACIC TRAUMA

OVERVIEW:
Thoracic injuries can be very dramatic, presenting with obvious physical findings that lead to immediate identification and management during the initial assessment, while others may only exhibit subtle signs and symptoms that can be easily missed initially. A high index of suspicion, accurate assessment, and frequent reassessment are necessary to identify both the apparent and less obvious thoracic injuries that could lead to lethal consequences. Thoracic injury may result from both penetrating and blunt trauma. Penetrating trauma has a tendency to be more obvious due to the presence of an open wound while blunt trauma may produce findings such as large contusions, tenderness, fractured ribs or flailed segments, or relatively little external evidence of injury. Although little external injury may be present, the patient may be suffering from multiple and severe organ, vascular, and structural injuries.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism: blunt vs penetrating • Loss of consciousness • Damage to structure, vehicle • Location in structure or vehicle • Speed, details of MVC: Restraints, protective devices • Medical history • Medications • Evidence of multi-system trauma	• Pain, swelling, bleeding • Deformity, lesions • Altered mental status, unconsciousness • Respiratory distress, failure • Hypotension, shock • Arrest • Significant mechanism of injury	• Tension pneumothorax • Flail chest • Pericardial tamponade • Open chest wound • Hemothorax

	EMR	EMT	A	I	P
1. Maintain scene and provider safety.	•	•	•	•	•
2. Perform general patient management.	•	•	•	•	•
3. Administer oxygen, to maintain *SPO_2* 94 - 99%. If needed, assist ventilations with BVM, maintain C-spine precautions.	•	•	•	•	•
4. If airway remains unstable, consider placement of definitive airway (*Supraglottic / dual lumen*) (*ETT I and P only*).		•	•	•	•
5. Identify mechanism of injury.	•	•	•	•	•
6. Assess breath sounds. Stabilize any chest injuries.*		•	•	•	•

THORACIC TRAUMA

	EMR	EMT	A	I	P
7. If patient has clinical findings consistent with tension pneumothorax and has hypotension/signs of shock, perform *needle decompression** per protocol.				•	•
8. Establish large bore IV's of normal saline. Titrate to systolic blood pressure of 90 to 100 mmHg.			•	•	•
9. Place patient on cardiac monitor per assessment.				•	•
10. Treat pain if indicated. Refer to *pain management protocol.*			•	•	•
11. Transport to the appropriate hospital per *trauma triage scheme* and reassess patient as indicated.		•	•	•	•

*Open Pneumothorax
Occlude initially with gloved hand as soon as found. As rapidly as possible, apply an occlusive dressing, taped on three sides over wound.

*Tension Pneumothorax
Perform chest decompression of the affected side, at the mid-clavicular line between the second and third intercostal space, per *Needle Thoracentesis Clinical Procedure*.

PEARLS:

1. The amount of external bleeding is not an indicator of the potential severity of internal bleeding associated with an underlying trauma.
2. Some injuries, such as simple rib fractures, may produce such excruciating pain that the patient intentionally hypoventilates to reduce chest wall movement causing secondary hypoxia.
3. Due to the amount of external noise, a possible pneumothorax should not be determined by lung sounds alone. In the presence of a true tension pneumothorax, the patient will also show signs of increasing tachycardia, decreasing SpO_2, tachypnea, and anxiety. Tracheal deviation away from the affected side is a late sign and may be difficult to assess in obese patients.
4. Careful reassessment of lung sounds should occur continuously. A patient that initially only has an open pneumothorax may quickly develop a tension pneumothorax and need needle thoracentesis after an occlusive dressing has been applied.
5. A true flail segment is two or three adjacent ribs, fractured in two or more places, which have the ability to move independently of the remaining chest wall.
6. Although paradoxical motion is often thought to be the hallmark sign of a flail chest, when the ribs fracture, the intercostal muscles may spasm, causing the flail segment to be initially stabilized. Paradoxical motion may be initially missed upon inspection while a thorough palpation exam will reveal any instability.
7. Stabilizing a flail segment with sandbags or other devices is no longer recommended. Carefully monitor for inadequate ventilations and provide positive pressure ventilations as needed.

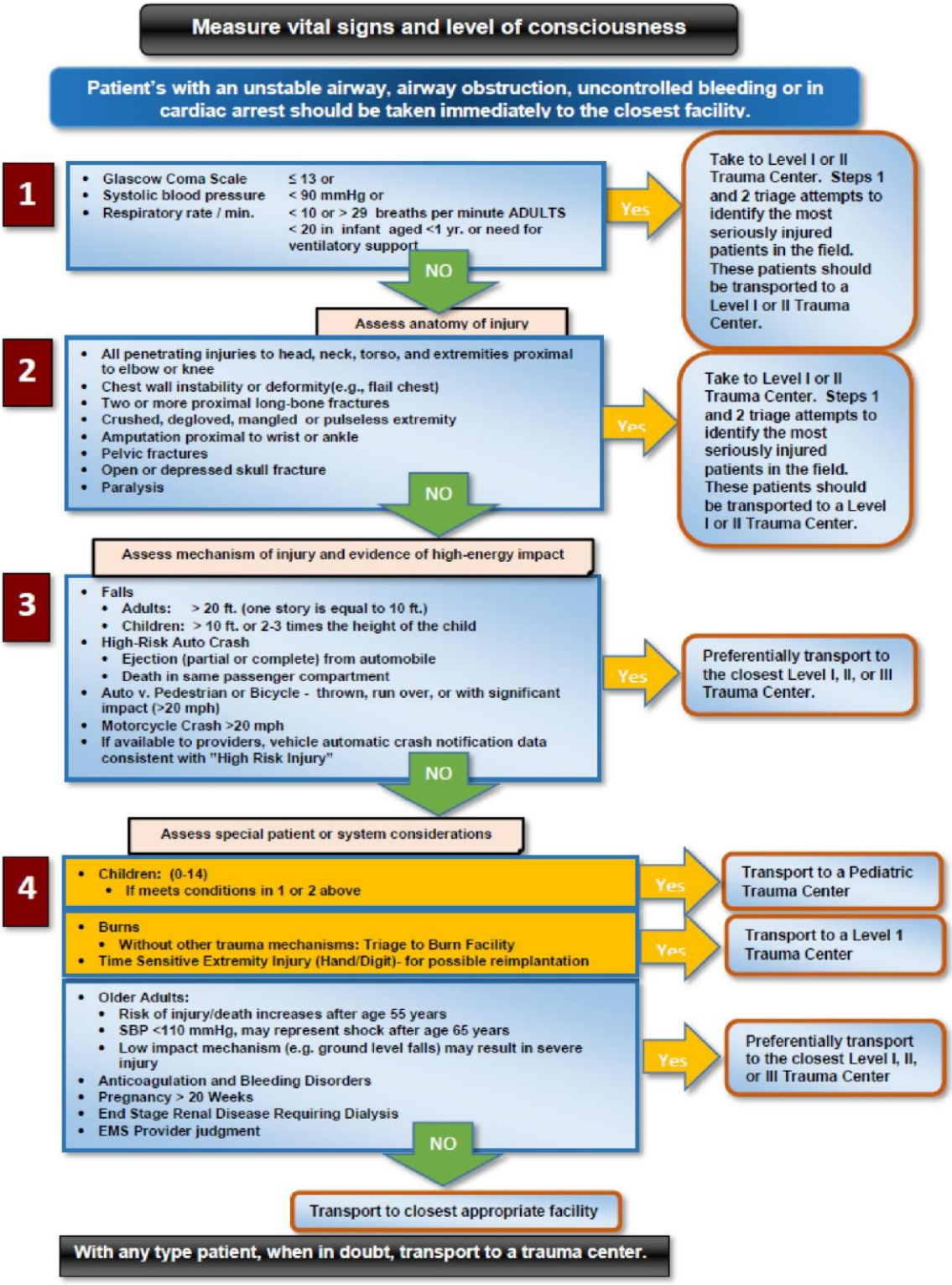
SECTION: Adult Trauma Emergencies

PROTOCOL TITLE: Injury – General Trauma Management
(Regional Field Triage Scheme)

REVISED: 06/2017

Protocol
4-12

FIELD TRAIGE SCHEME



This page intentionally
left blank

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Injury – Spinal Motion Restriction

REVISED: 08/2019

Protocol
4-13

SPINAL MOTION RESTRICTION

OVERVIEW:
Mechanism of injury alone has not been shown to be a predictor for spinal injury. An appropriate patient assessment can be used to determine need for spinal motion restriction. The below is cervical spinal motion restriction selection guidelines taken from National Model Guidelines V2 and NEXUS (National Emergency X-Radiography Utilization Study.

There is limited data studying spinal motion in patients with applied cervical collars. Patient exiting out of car under their own power, with cervical collar in place, may result in the least amount of motion of the cervical spine.[i] Cervical spinal motion restriction devices include, but are not limited to soft and hard collars.

Long back boards have not been shown to reduce spinal injury complications. Long backboards are associated with increased pain, decubitus development, and possibly decreased functional residual capacity of the lungs. Long backboards and scoop stretchers may be used for the safe movement/transfer of patients. However, if used in this way, patients should be removed from the device as soon as possible.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism of injury (blunt vs. penetrating) • Restraints/protective devices • Prior cervical spine surgery • Known vertebral disease • Medical history • Medications • Evidence of multi-system trauma	• Spine pain • Limited neck mobility • Neurological deficit • Unstable/abnormal vital signs	• Spinal cord injury • Fracture of vertebrae • Head injury • Neurogenic shock • Distracting injury (long bone injury, deformity, non life threatening bleeding)

	EMR	EMT	A	I	P
1. Maintain scene and provider safety.	•	•	•	•	•
2. Perform general patient management.	•	•	•	•	•
3. Support life-threatening problems.	•	•	•	•	•
4. Spinal motion restriction is not recommended in patients with penetrating trauma.		•	•	•	•

SPINAL MOTION RESTRICTION

5. Cervical spinal motion restriction should be used in patients meeting the below criteria. a. Patients between 15 and 65 years of age with a traumatic mechanism and any one (1) of the following: - Midline cervical tenderness - Neuro deficits - Altered mental status - Intoxication - Distracting injury b. Patients 65 years of age and older with traumatic mechanism and suspected spinal injury should have cervical spinal motion restriction. c. Any patient where provider judgement indicates use of SMR (i.e. seatbelted in cot, backboard, reeves).		•	•	•	•
6. Backboards may be used for movement or extrication of the patient. Patients should be removed from the backboard as soon as possible.		•	•	•	•
7. Transport to an appropriate facility as indicated by the Regional Field Triage Scheme if applicable, and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

- EMS Providers are expected to use good judgment and may elect to apply cervical spinal motion restriction device to any patient.
- Mechanism of injury alone has not been shown to be a predictor for spinal injury. All patients with a dangerous mechanism of injury, AMS, spine tenderness, distracting injuries, or an unreliable physical exam should be treated in such a manner as to limit spinal motion.

References

[i] West J Emerg Med. 2009 May; 10(2): 74–78. **Cervical Spine Motion During Extrication: A Pilot Study**
Jeffery S. Shafer, MD, EMTP and Rosanne S. Naunheim, MD

This Page Left Intentionally Blank

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Hemorrhage Control

REVISED: 06/2017

Protocol
4-14

HEMORRHAGE CONTROL

OVERVIEW:
When treating soft tissue injuries, control of blood loss, prevention of shock, and decontamination of affected areas take priority. Unless you note extensive bleeding, wound management by dressing and bandaging is a late priority in the care of trauma patients. Dress and bandage wounds whose bleeding does not represent a life threat only after you stabilize your patient by caring for higher priority injuries.

HPI	Signs and Symptoms	Considerations
• Time of injury • Mechanism: blunt vs penetrating • Significant mechanism of injury • Loss of consciousness • Medical history • Medications (anticoagulants) • Evidence of multi-system trauma	• Pain • Swelling • Deformity • Lesions • Respiratory distress or failure • Hypotension or shock • Cardiac arrest	• Arterial versus venous bleeding

	EMR	EMT	A	I	P
1. Maintain scene and provider safety.	•	•	•	•	•
2. Ensure appropriate PPE is donned to limit potential exposure to bloodborne pathogens.	•	•	•	•	•
3. Perform general patient management.	•	•	•	•	•
4. Support life-threatening problems.	•	•	•	•	•
5. Apply oxygen to maintain pulse ox 94-99%. If indicated, support respirations with a BVM.	•	•	•	•	•
6. With a gloved hand, apply direct pressure with a dressing to the site of hemorrhage.	•	•	•	•	•
7. If serious hemorrhage persists, expose the wound and place digital pressure with a gloved hand on the site of bleeding.	•	•	•	•	•
a. If bleeding controlled, bandage the dressing in place, maintaining pressure on the wound.	•	•	•	•	•
8. For uncontrolled life threatening bleeding of an extremity, consider application of a TOURNIQUET.	•	•	•	•	•
9. If extremity bleeding still uncontrolled:					
a. Consider application of a second tourniquet proximal to the first.	•	•	•	•	•
b. Consider applying hemostatic gauze or packing to wound.	•	•	•	•	•

	A	B	EN	I	P
10. If patient shows signs of hypoperfusion, refer to **Protocol 3-13: Hypotension/Shock.**	•	•	•	•	•
11. Transport to closest appropriate facility and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

1. The amount of external bleeding is not an indicator of the potential severity of internal bleeding associated with an underlying trauma.

SECTION: Adult Trauma Patient Care

PROTOCOL TITLE: Traumatic Cardiac Arrest

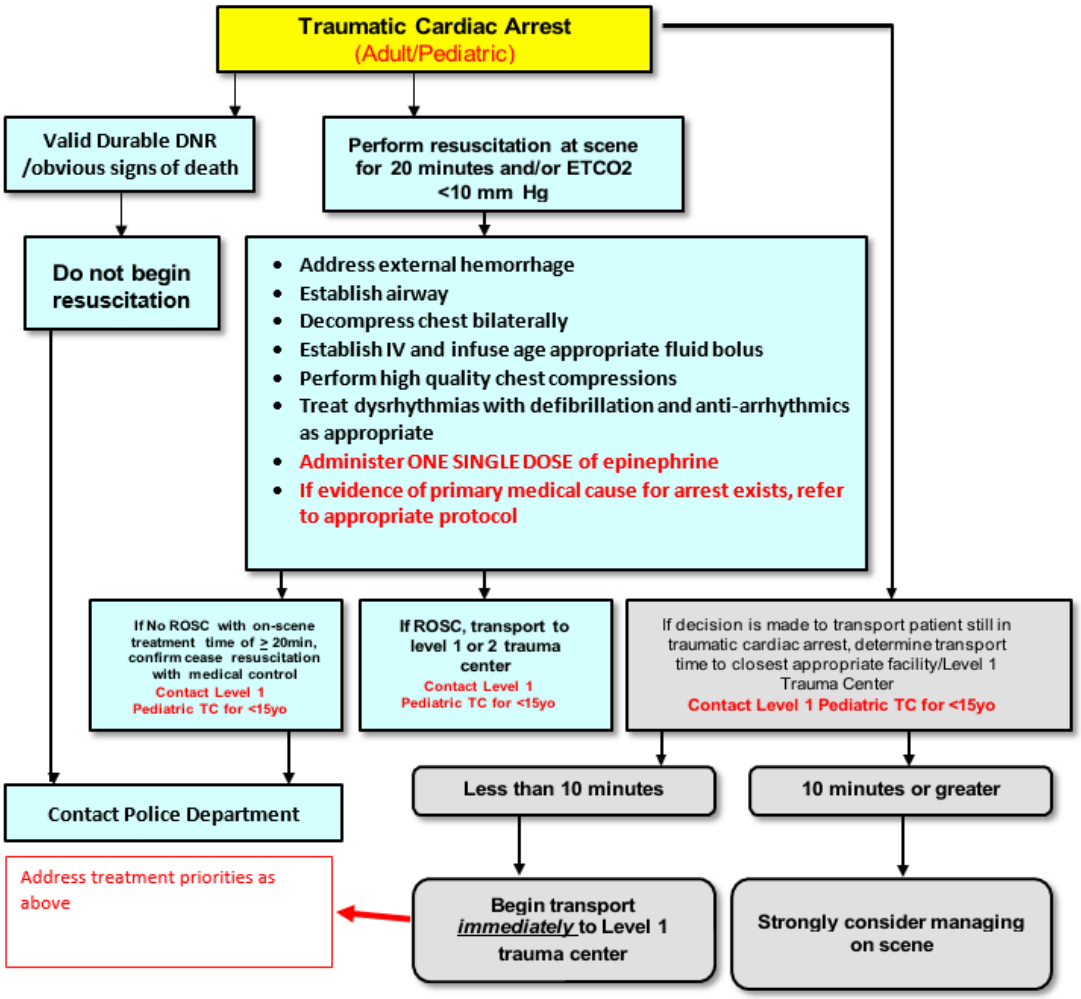
EFFECTIVE: 07/2021

Protocol
4-15

TRAUMATIC CARDIAC ARREST

OVERVIEW:

Survival from traumatic cardiac arrest is poor. Ideally and preferentially, the clinical care of patients in traumatic arrests are managed in the field until ROSC or termination of efforts. The distance from the level 1 or 2 trauma center may play a role in transport decisions. Transport times greater than 15 minutes to the trauma center should be managed in the field unless extenuating circumstances exist. The following algorithm is intended to serve as a guideline in conjunction with Protocol 12-9.



PEARLS:

1. The traditional use of 14-gauge IV catheters at the standard midclavicular line has come under scrutiny. One study showed that a 5.0 cm catheter would be unlikely to access the pleural cavity in half of adult patients in the standard position. Consider anterior mid-axillary placement for larger adults.
2. Penetrating vs. blunt traumatic cardiac arrest: Historically, one of the most important factors that should be considered in the management of traumatic cardiac arrest is the etiology of the traumatic cardiac arrest. Penetrating trauma- gunshot wounds and stab wounds in particular-have much better outcomes than blunt traumatic arrest.
3. AHA Guidelines for CPR and Emergency Cardiovascular Care makes no mention of the use of ACLS drugs in the section on cardiac arrest associated with trauma. It may impair tissue perfusion in hemorrhagic shock. If used, it should be limited to a single dose early in resuscitation for traumatic arrests.
4. Medical Direction strongly encourages providers to focus on managing external hemorrhaging, establishing an airway, needle decompression as needed, performing high quality chest compressions, and defibrillation as appropriate.
5. Priority of transport destination for traumatic arrest is:
   - Level 1 Trauma Center
   - Level 2 Trauma Center
   - Level 3 Trauma Center
   - Closest Appropriate Facility
6. Continuous scene safety and security should also be considered in transport decisions.