Initial Management of All Pediatric Trauma Patients

- Stabilize ABCs and c-spine (Airway, Breathing, and Circulation)
  - Initiate spinal motion restriction as indicated. Position for optimal airway and suction as needed. Position infants and children < 2 y/o supine on a backboard with a recess for the head or use a pad under the back from the shoulders to the buttocks.
  - Consider needle decompression for signs of pneumothorax, hemothorax or tension pneumothorax
- Obtain weight (actual or use of weight/length based tool)
- Establish 2 peripheral IVs (consider large bore if possible) or if unable, establish intraosseous (IO) access
- Control any external bleeding
- Avoid removal of penetrating objects in the emergency department (should be performed in operating room due to risk of hemorrhage)
- Monitor
  - Heart Rate (HR), Blood pressure (BP), Oxygen Saturation (SpO₂), mental status, temperature, perfusion, urine output, bedside glucose
- Perform detailed primary and secondary history & physical exam including mechanism of injury, Pediatric Trauma Score (PTS) and Pediatric Glasgow Coma Scale (PGCS)
- Consult pediatric care medical specialist for assistance with care of the acutely and critically injured patient (see below for Level I Trauma Criteria), to individualize the care of patient, if patient does not improve and needs to be admitted/transferred and as needed for further support and consult.
- Category 1 Trauma Criteria (minimum):
  - All penetrating injuries to head, neck, torso, and/or groin
  - Two or more body regions with potential threat to life or limb
  - Combination trauma with ≥20% TBSA burn
  - Limb paralysis and/or sensory deficit above the wrist and ankle
  - Flail chest
  - Amputation proximal to wrist or ankle
  - Blunt or penetrating trauma with unstable vital signs AND/OR:
    - Hemodynamic compromise (Pediatric SBP≤80)
    - Respiratory compromised (Respiratory rate <10 or >29)
    - Altered mentation (PGCS≤10)
- Additional Blast Injury Considerations:
  - Classification of Blast Injuries (see page 102 for more detailed information on pediatric clinical presentations for common blast injuries and management of specific blast injuries)
    - Primary
      - Results from impact of the over-pressurized blast wave
      - Gas filled/ hollow structures most susceptible
      - Examples: blast lung, tympanic membrane rupture, abdominal hemorrhage and perforation, eye globe rupture, traumatic brain injury (TBI) without physical signs of head injury
Secondary
- Results from flying debris and bomb fragments
- Entire body may be affected
- Examples: penetrating and blunt trauma injuries, eye penetration

Tertiary
- Results from victims being thrown by blast wind
- Entire body may be affected
- Examples: fractures, amputations, closed and open brain injury

Quaternary
- All injuries, illnesses not due to Primary, Secondary or Tertiary mechanisms
- Entire body may be affected
- Example: crush injuries, burns, asphyxia, toxic exposures, exacerbation or complications from existing or chronic conditions
**Management for Pediatric Trauma & Blast Injury Patients**

**Determine if patient is critically ill/injured**
- Capillary refill > 2 seconds
- Slow or fast breathing rate
- Penetrating wound to head/chest/abdomen
- Significant blunt trauma to chest/abdomen
- Pelvic/femoral fracture
- Open chest wound
- Spinal injury with paresthesia
- Unconscious/history of LOC
- Amputation/crush injury
- Respiratory distress/failure
- Signs/symptoms of intra-abdominal injury:
  - Hematuria, Grey Turner sign (discoloration of flank/periumbilical area), abdominal asymmetry/distention, tender/guarding/pain on palpation
- Signs of Shock
- Unconsciousness
- Amputation/crush injury
- Respiratory distress/failure
- Hypovolemic shock
- Signs of Shock
- Intubated as needed to protect airway
- Tidal volume: 6-10 mL/kg
- I-time: 0.5-1.0
- Respiratory rate: set based on age
- PEEP: 3-5 mm H2O
- Peak Inspiratory Pressure: 20-30 mm H2O
- For more information, see: *Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition*

**YES**

**NO**

- Treat all life threatening injuries:
  - Protect airway:
    - Apply supplemental oxygen to maintain SpO₂ ≥ 94%
    - Use NPA/OPA as needed if not contraindicated
    - Intubated as needed to protect airway
    - Tidal volume: 6-10 mL/kg
    - I-time: 0.5-1.0
    - Respiratory rate: set based on age
    - PEEP: 3-5 mm H2O
    - Peak Inspiratory Pressure: 20-30 mm H2O
    - For more information, see: *Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition*
  - Control any bleeding
  - Administer 0.9 NS IVF bolus 20 mL/kg if signs of hypoperfusion exist. Repeat x 2 PRN
  - Consider PRBCs if patient does not respond to IVF boluses (10 mL/kg)
  - Perform x-rays, CTs as indicated:
    - Immobilize/splint/stabilize any fractures
  - Draw labs as indicated (CBC, CMP, PT/PTT, urine analysis, Type and Screen)
  - Initiate pain control
  - Administer antibiotics and tetanus as indicated
  - Perform detailed head to toe assessment (see pg. 7 for details)
  - Additional Blast Injury Considerations:
    - See page 8 of this care guidelines for detailed assessment and management for blast injuries
    - Maintain urine output of 2-4 mL/kg/hr
    - Prolonged extrication requires high fluid volume and possible alkanization of the urine
    - For potential potential rhabdomylosis (0.45% NS with 50 mEq/liter of sodium bicarbonate)
    - Monitor urine for RBCs and myoglobin
    - Obtain CKMB, ECG and maintain cardiac monitor
    - Consider compartment syndrome if pain disproportionate to injury
    - Consider performing a fasciotomy (if experienced/skilled practitioner available or after...
Reassess

Worse, not improved or not normalized, or improved but not normalized

- Repeat 0.9NS IVF bolus 20mL/kg x 2 PRN
- Consult with pediatric care medical specialist for possible transfer
- Monitor CMS, neuro status and vital signs every 2-4 hours
- Admit patient
- See Sample admission orders (pg. 5 of this care guideline)

- Administer 0.9NS IVF bolus 20mL/kg x 1 PRN
- Perform x-rays, CTs and labs as indicated by injuries.
- Immobilize and splint and identified fractures
- Check for growth plate involvement
- C-Spine x-rays NOT required if (per ATLS Guidelines):
  - No neck pain or palpable tenderness AND
  - No distraction injury AND
  - GCS 15 AND
  - Not intoxicated or under influence of drugs
- Assess circulation, movement and sensation (CMS) and neuro checks every 2 hours as indicated
- Pain control as needed (consider pharmacological and non-pharmacological pain control measures)
- Blast injury Considerations:
  - Monitor urine for RBCs and myoglobin
  - Obtain ECG if indicated
  - Maintain urine output of 2-4mL/kg/hr

Reassess

Worse, not improved or not normalized, or improved but not normalized

Improved

- Monitor for 6-8 hours and if:
  - Stable vital signs AND
  - Neuro status appropriate for age AND
  - CMS intact AND
  - Serial exams show no signs of deterioration
  - Discharge with appropriate follow up instructions
Sample Pediatric Trauma/Blast Injury Admission Orders

Admitting physician: ____________________________________________________________

Diagnosis: ___________________________________________________________________

Condition:  □ Critical  □ Serious  □ Stable

Weight (kg):__________________  Height (cm):__________________

Allergies: ___________________________________________________________________

Assessment:
□ Continuous cardiac monitoring
□ Continuous pulse oximetry
□ Blood pressure with all vital signs
□ Routine I&O
□ Strict I&O q 1 hour (maintain urine output at 2-4mL/kg/hr)
□ Daily weight
□ Seizure precautions
□ Neuro checks every_____ hours
□ Perform CMS checks on extremities every _____hours to monitor for compartment syndrome/crush syndrome

Tests:

Medications:
□ Analgesics/Antipyretics:
   □ Acetaminophen (Tylenol) (15mg/kg/dose)__________mg PO/GT every 4 hrs PRN for temperature ≥ 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
   □ Acetaminophen (Tylenol) (20mg/kg/dose)__________mg PR every 4 hrs PRN for temperature ≥ 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
   □ Ibuprofen (Motrin) (10mg/kg/dose)__________mg PO/GT every 6 hours PRN for temperature ≥ 38.6°C/101.5°F or discomfort (for infants >5 months). Ensure adequate renal function before utilizing.
   □ Analgesics
      □ Acetaminophen with hydrocodone (Hycet/Lortab/Lorcet/Norco) ________mg/kg PO every 4-6 hours PRN for pain
      □ Morphine (0.1-0.2 mg/kg) _____ mg IV every 2-4 hours as needed (max 10mg/dose)
      □ Fentanyl _______mg IV every ______hours as needed.

□ Antibiotics: _________________________________________________________________
   □________________________________________________________________________
   □________________________________________________________________________
   □________________________________________________________________________

□ Topical anesthetic for IV start and lab draws
   □ Apply topically once 30-90 minutes prior to procedure (maximum 1gm, 10 centimeter area squared, or application time of 2 hours)

IV Therapy:
□ Saline Lock
□ NS bolus ________ mL IV to run over 1 – 2 hours
□ LR bolus ______mL IV to run over 1-2 hours
□ D5 0.45 NS with 20 mEq KCl/L to run at ________mL/hr (Ensure adequate renal function before utilizing potassium)
□ D5 0.2 NS with 20 mEq KCl/L to run at ________mL/hr (Ensure adequate renal function before utilizing potassium)
□ Other

Supplemental Oxygen Orders:

- If SpO₂ < 90% on room air, apply oxygen to maintain SpO₂ 91-94%
  - Nasal Cannula
  - Aerosol Mask
- Titrate oxygen to maintain SpO₂ > 90%
- Wean oxygen if SpO₂ maintains 94%.
  - Decrease oxygen by ½ liter per minute (LPM) and reassess patient 5-10 minutes after change in oxygen
  - Do not decrease oxygen more frequently than every 60 minutes

□ Ventilator Settings:
  - For more information, see: Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition

□ See Sample Pediatric Standard Admission Orders for additional examples for diet, IV, labs etc.
□ If hypovolemic, refer to Pediatric Shock Care Guidelines: Sample Hypovolemic Shock Admission Orders
Detailed Assessment of Pediatric Trauma Patients

- Inspect/palpate each body area for DCAP-BLS, TIC, PMS (Deformity, contusions, abrasions, punctures, burns, lacerations, swelling, tenderness, instability, crepitus; + pulses, motor, and sensory ability) as appropriate plus:
  - MENTAL STATUS: Assess mentation using the Pediatric Glasgow Coma Score (PGCS), Neuro exam, motor/sensory, nuchal rigidity, appearance, tone, acting appropriate for age, consolability, look/gaze, and speech/cry.
  - HEAD, FACE, EYES, EARS, NOSE, MOUTH: Note any drainage; re-inspect pupils for size, shape, equality, fixed deviation and reactivity; conjugate movements; note gross visual acuity
  - NECK: Carotid pulses, neck veins, subcutaneous (Sub-Q) emphysema, location of trachea, and cervical spines
  - CHEST: Expose chest as needed. Auscultate breath/heart sounds.
  - RESPIRATION/VENTILLATION: rate, rhythm, pattern and work of breathing
  - ABDOMEN: Signs of injury/peritonitis. Note contour, visible pulsations, wounds/bruising patterns, pain referral sites, localized tenderness, guarding, rigidity
  - PELVIS/GU: Inspect perineum and apply PASG/mast trousers if suspected pelvic fracture.
  - EXTREMITIES: Inspect for position, false motion, skin color, and signs of injury
  - BACK: Note any muscle spasms
  - SKIN/SOFT TISSUE: Inspect/palpate for color, temperature, moisture, signs of SQ emphysema, pulses in all extremities, capillary refill

### Pediatric Trauma Score (age 12 and under)

<table>
<thead>
<tr>
<th>Component</th>
<th>+2</th>
<th>+1</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>&gt; 20kg</td>
<td>11-20kg</td>
<td>≤ 10kg</td>
</tr>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>Maintainable</td>
<td>Unmaintained</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>&gt;90mmHg</td>
<td>50-90mmHg</td>
<td>&lt; 50 mmHg</td>
</tr>
<tr>
<td>CNS</td>
<td>Awake</td>
<td>Obtunded/lost consciousness</td>
<td>Coma/unresponsive</td>
</tr>
<tr>
<td>Skeletal Injury</td>
<td>None</td>
<td>Closed fracture</td>
<td>Open/multiple fractures</td>
</tr>
<tr>
<td>Open Wounds</td>
<td>None</td>
<td>Minor</td>
<td>Major/penetrating</td>
</tr>
</tbody>
</table>

Score of < 8 usually indicates the need for evaluation at a Trauma Center.

### Pediatric Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Category</th>
<th>For Patients &lt;2 Years Old</th>
<th>For Patients &gt;2 Years Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Opening (E)</td>
<td>(4) Spontaneous</td>
<td>(4) Spontaneous</td>
</tr>
<tr>
<td></td>
<td>(3) To speech</td>
<td>(3) To speech</td>
</tr>
<tr>
<td></td>
<td>(2) To pain</td>
<td>(2) To pain</td>
</tr>
<tr>
<td></td>
<td>(1) None</td>
<td>(1) None</td>
</tr>
<tr>
<td>Verbal Response (V)</td>
<td>(5) Coos, babbles, appropriate words</td>
<td>(5) Oriented</td>
</tr>
<tr>
<td></td>
<td>(4) Irritable, cries</td>
<td>(4) Confused</td>
</tr>
<tr>
<td></td>
<td>(3) Cries to pain</td>
<td>(3) Inappropriate words</td>
</tr>
<tr>
<td></td>
<td>(2) Moans to pain</td>
<td>(2) Incomprehensible</td>
</tr>
<tr>
<td></td>
<td>(1) None</td>
<td>(1) None</td>
</tr>
<tr>
<td>Motor Response (M)</td>
<td>(6) Normal spontaneous movements</td>
<td>(6) Obey commands</td>
</tr>
<tr>
<td></td>
<td>(5) Withdraws from touch</td>
<td>(5) Localizes to pain</td>
</tr>
<tr>
<td></td>
<td>(4) Withdraws from pain</td>
<td>(4) Withdrawal to pain</td>
</tr>
<tr>
<td></td>
<td>(3) Abnormal flexion (decorticat)</td>
<td>(3) Flexion to pain</td>
</tr>
<tr>
<td></td>
<td>(2) Abnormal extension (decerebrate)</td>
<td>(2) Extension to pain</td>
</tr>
<tr>
<td></td>
<td>(1) None</td>
<td>(1) None</td>
</tr>
</tbody>
</table>
### Detailed Assessment and Management of Blast Injury


<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Presentation</th>
<th>Diagnosis</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal injury</td>
<td>- Injury presentation may be subtle and variable</td>
<td>- Similar to standard abdominal trauma</td>
<td>- NPO</td>
</tr>
<tr>
<td></td>
<td>- Signs/symptoms: abdominal pain, rebound tenderness, absent bowel sounds,</td>
<td>- Serial abdominal exams</td>
<td>- Avoid removal of penetrating objects in the emergency department (perform in OR)</td>
</tr>
<tr>
<td></td>
<td>nausea, vomiting, fever and signs of hypovolemia or hemorrhage</td>
<td>- Laboratory tests</td>
<td>- Antibiotics, tetanus vaccination</td>
</tr>
<tr>
<td></td>
<td>- Injuries following underwater blasts have increased severity</td>
<td>- Radiology tests: fee air, unexplained ileus, intra-abdominal hematoma/</td>
<td>- Serial exams and laboratory monitoring</td>
</tr>
<tr>
<td></td>
<td><strong>Pediatric Considerations:</strong></td>
<td>hemorrhage, solid organ contusion/laceration, intra-abdominal abscess</td>
<td>- Women in 2nd and 3rd trimester should have fetal monitoring</td>
</tr>
<tr>
<td></td>
<td>- Smaller and more pliable ribs and thinner abdominal walls leaves</td>
<td></td>
<td>- All pregnant women should have a Kleihauer-Betke test:</td>
</tr>
<tr>
<td></td>
<td>abdominal organs unprotected so children are more prone to abdominal injuries</td>
<td></td>
<td>- Positive requires mandatory pelvic ultrasound, fetal non-stress test</td>
</tr>
<tr>
<td></td>
<td>- Proportionally, children have larger organs so they are more prone to</td>
<td></td>
<td>- test monitoring and OB/GYN consult</td>
</tr>
<tr>
<td></td>
<td>injury</td>
<td></td>
<td>- Radiology exams: plain abdominal films, CT scan, Focused Abdominal</td>
</tr>
<tr>
<td></td>
<td>- Spleen and liver are especially more vulnerable to injury from blunt and</td>
<td></td>
<td>Sonography for Trauma (FAST)</td>
</tr>
<tr>
<td></td>
<td>penetrating force trauma.</td>
<td></td>
<td>- Appropriate referral to trauma center as applicable</td>
</tr>
<tr>
<td></td>
<td><strong>Pediatric Considerations:</strong></td>
<td></td>
<td>- Strict discharge and return instructions if signs/symptoms of abdominal</td>
</tr>
<tr>
<td></td>
<td>- Traumatic asphyxia results from sudden compression of the abdomen or</td>
<td></td>
<td>injury occur after discharge</td>
</tr>
<tr>
<td></td>
<td>chest against a closed glottis. Symptoms include: hyperemic sclera, seizures, disorientation, petechiae on upper body, respiratory failure. Treatment is supportive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain/ Neurological/ Cervical Injury</td>
<td>- Head injury is most common cause of death in bombings</td>
<td>- Glasgow Coma Scale (GCS)/ Pediatric Glasgow Coma Scale (PGCS)</td>
<td>- Record initial GCS/PGCS and reassess per protocols</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Re-evaluate patient every 24 hours or sooner if symptoms worsen</td>
</tr>
</tbody>
</table>
### IDPH ESF-8 Plan: Pediatric and Neonatal Surge Annex

#### Trauma and Blast Injury Care Guideline

<table>
<thead>
<tr>
<th>Diffuse axonal injury, skull fractures, coup-counter-coup injury, subarachnoid and subdural hemorrhage common</th>
<th>Mild TBI: At least 1 of the following inclusion criteria present:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Traumatic Brain Injury (mTBI) may go undiagnosed or misdiagnosed as PTSD</td>
<td>Any period of LOC and GCS/PGCS of 13-15 after the LOC</td>
</tr>
<tr>
<td>May or may not have history of loss of consciousness (LOC)</td>
<td>Any loss of memory of the event immediately before or after the incident with posttraumatic amnesia of &lt; 24hrs</td>
</tr>
<tr>
<td>Headache, seizures, dizziness, memory problems</td>
<td>Any alteration in mental status at the time of incident</td>
</tr>
<tr>
<td>Gait/balance problems, nausea, vomiting, difficulty concentrating</td>
<td>Moderate to Severe TBI: GCS/PGCS &lt; 12</td>
</tr>
<tr>
<td>Visual Disturbances, tinnitus, slurred speech</td>
<td>CT scan for hemorrhage, cerebral contusion, fracture, foreign bodies</td>
</tr>
<tr>
<td>Disoriented, irritable, confused</td>
<td>MRI is more sensitive to diagnosis diffuse axonal injury</td>
</tr>
<tr>
<td>Extremity weakness or numbness</td>
<td>Complete rest until asymptomatic</td>
</tr>
</tbody>
</table>

**Pediatric considerations:**
- Traumatic brain injury (TBI) can occur in patients who have not had a loss in consciousness. Children may appear alert and awake initially but should be evaluated if they have any of the following symptoms:
  - Abnormal behavior (i.e. irritability, excessive sleepiness)
  - Persistent vomiting
  - Seizures
  - Loss of consciousness
  - Evidence of CSF leak
- Young children have immature neck musculature and relatively large heads which makes them more prone to cervical spine injuries in C1-C3.
- Children less than 8 years old are susceptible to SCIWORA (spinal cord injury without radiographic abnormality)

**Maintain:**
- Cerebral perfusion pressure
- Body temperature
- Neuromuscular blockage and sedation (for intubated patients)
- Cervical spine control
- Glucose control
- Seizure control
- DVT prophylaxis

Symptoms that persist beyond 7-10 days suggests post-concussion syndrome and warrants additional follow up.
<table>
<thead>
<tr>
<th><strong>Crush Injury and Crush Syndrome</strong></th>
<th><strong>Ear Injury</strong></th>
<th><strong>History of events/injury</strong></th>
<th><strong>Laboratory tests</strong></th>
</tr>
</thead>
</table>
| - Consider cervical spine injury in children with head injury | - Reperfusion syndrome:  
  o Hypotension  
  o Renal failure d/t rhabdomyolysis, myoglobinuria and metabolic abnormalities  
  o Metabolic abnormalities (hypocalcemia, hyperkalemia, metabolic acidosis)  
  - Cardiac arrhythmias  
  - Compartment syndrome | - If possible, administer IVF before releasing crushed body part  
  - Administer IV hydration  
  o Maintain urine output of 2-4mL/kg/hr  
  - Monitor for cardiac arrhythmias  
  - Treat hyperkalemia and hypocalcemia  
  - Alkalize the urine  
  - Monitor for renal failure-consider hemodialysis as needed  
  - Monitor for compartment syndrome  
  - Monitor urine for red blood cells  
  - Treat open wounds with antibiotics and tetanus vaccination  
  - Observe all crush injuries and monitor for the pain, pallor, paresthesia, pain with passive movement and pulselessness | - History of events/injury  
  - Laboratory tests |
<table>
<thead>
<tr>
<th>Extremity Injuries</th>
<th>Eye Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>nerve palsy, CNS complications (brain abscess &amp; meningitis)</td>
<td>nerve palsy, CNS complications (brain abscess &amp; meningitis)</td>
</tr>
<tr>
<td>• Inner Ear: o Damage to auditory and vestibular components o Temporary hearing changes</td>
<td>• Document systemic musculoskeletal, neurological, and vascular states of each extremity</td>
</tr>
<tr>
<td>• Traumatic amputations: primarily occur through bony shaft rather than joint disarticulations</td>
<td>• Document each open wound</td>
</tr>
<tr>
<td>• Fragments imbedded into extremity</td>
<td>• Photograph if possible</td>
</tr>
<tr>
<td>• Blunt force injuries</td>
<td>• Radiological exams as indicated</td>
</tr>
<tr>
<td>• Crush injuries (see above for more information)</td>
<td>• Perform thorough debridement</td>
</tr>
<tr>
<td></td>
<td>• Antibiotics for all open fractures</td>
</tr>
<tr>
<td></td>
<td>• Obviously contaminated wounds: o Irrigate with sterile saline; dress with Betadine soaked sponges</td>
</tr>
<tr>
<td></td>
<td>• Tetanus prophylaxis if indicated</td>
</tr>
<tr>
<td></td>
<td>• Splint fractured extremities</td>
</tr>
<tr>
<td></td>
<td>• Surgical management: o Initial debridement and bony stabilization should be done in OR</td>
</tr>
</tbody>
</table>

Eye Injuries:
- Presents with wide range of symptoms
- Significant eye damage may be present with normal vision and minimal symptoms (irritation, foreign body sensation, altered vision, bleeding, periorbital swelling or bruising)
- Minor injuries include: Corneal abrasions, conjunctivitis, superficial foreign bodies
- Open globe (360° conjunctival hemorrhage, misshapen pupil, brown/pigmented tissue outside of globe, clear gel like tissue outside of globe, abnormally deep or shallow anterior chamber
- Eyelid lacerations are common
- Serious non-penetrating injuries: hyphema, traumatic cataract, citrous hemorrhage, retinal detachment, choroidal rupture and optic nerve injuries

Eye Injuries:
- Obtain visual acuity
- Test for light perception, hand motion and count fingers
- Thin cut CT scan of orbits may help identify foreign bodies
- MRI is contraindicated until proven that no metal foreign bodies are present
- Do not force eyelid open-defer exam if massive swelling is present
- Assume all eye injuries may also be ruptured globe
- Do not patch or bandage the eye
- Use convex plastic or metal shield or the bottom of a clean paper cup taped in place
- Do not remove impaled FBs
- Tetanus if indicated
- Administer anti-emetics for nausea and vomiting
- Administer IV broad spectrum antibiotics if rupture globe is suspected
- Consult an ophthalmologist as soon as possible
- Rapid transport to facility with ophthalmic OR capabilities is primary goal
### Lung/Chest Injury
- May present with no external injuries to chest
- Symptoms: dyspnea, hemoptysis, cough, chest pain
- Signs: tachypnea, hypoxia, cyanosis, apnea, wheezing, decreased breath sounds, hemodynamic instability
- Associated pathology: bronchopleural fistula, air emboli, hemothorax, pneumothorax

**Pediatric Considerations:**
- Chest injuries are a common cause of death in children after an explosive event. Below are some anatomical features found in children that affect their injury pattern:
  - Chest wall is more compliant so rib fractures are less common. Severe thoracic injuries can occur without significant external evidence of injury
  - Mediastinal structures are more mobile. Tension pneumothorax can shift mediastinum and cause respiratory and cardiovascular compromise. Suspect tension pneumothorax in children who are hypotensive and hypoxic
  - Traumatic asphyxia results from sudden compression of the abdomen or chest against a closed glottis. Symptoms include: hyperemic sclera, seizures, disorientation, petechiae on upper body, respiratory failure. Treatment is supportive.

### Chest radiography:
- Characteristic “butterfly” pattern

### Arterial blood gases (ABG)

### CT Chest

### Doppler

### Care is similar to a pulmonary contusion
- Cautious IVF use ensuring tissue perfusion without volume overload
- High flow oxygen to prevent hypoxemia
- Secure airway for: impending airway compromise, secondary edema, injury or massive hemoptysis
- Prompt decompression for hemo- or pneumothorax
- Use caution with decision to intubate patient-mechanical ventilation and positive end pressure may increase risk of alveolar rupture and air embolism
- Air embolism: high flow oxygen; place patient in prone, semi-left lateral or left lateral position and transfer to hyperbaric chamber
- Patients with normal chest xray and ABG and no complaints can be discharged after observing for 4-6 hours

### Mental health
- Will vary based on age and developmental level

### Mental health
- Provide psychological first aid (PFA)
- Refer to behavioral health specialist as indicated