

# **East Central Illinois EMS System**



## **Adult Protocol Manual**

***2020***



# Preface

The following medical treatment protocols were developed for use by credentialed providers within the OSF HealthCare East Central Illinois EMS System. Optimal prehospital care results from a combination of careful patient assessment, essential prehospital emergency medical services and appropriate medical consultation. The purpose of this manual is to provide guidance for prehospital care providers within the East Central Illinois EMS System. These protocols were adapted based on the NASEMSO National Model EMS Guidelines Version 2.2, AHA guidelines, as well as other evidence-based information from local and national standards.

The medical protocols are divided into different sections. The upper section includes three boxes (History, Signs and Symptoms and Differential) which serve as a guide to assist in obtaining pertinent patient information and exam findings as well as considering multiple potential causes of the patient's complaint. It is not expected that every historical element or sign / symptom be recorded for every patient, however the pertinent aspects shall be included in the patient evaluation. The protocol section describes the essentials of patient care. Virtually every patient should receive the care outlined in this section. However, each medical emergency must be dealt with individually and appropriate care determined accordingly. Professional judgment is mandatory in determining treatment modalities within the parameters of these protocols. Circumstances will arise where treatment may move from one protocol to another. The *'Pearls'* section provides key points and educational pearls regarding the protocol. The *'Key Documentation Elements'* and the *'Pertinent Assessment Findings'* sections serve to help the prehospital provider in appropriate documentation of the patient encounter. The final section, *'Quality Metrics'*, was added in an effort for continuous quality improvement. These metrics were based on the NASEMSO National Model EMS Guidelines Version 2.2 as well as metrics specific to East Central Illinois EMS.

From time to time, protocols may be added or revised. Additional recommendations are welcome and appreciated at any time. They may be submitted to the East Central Illinois EMS office for consideration.

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# Preface

## Introductory Letter to the System

The vision of the East Central Illinois EMS System is to be an integrative, high performance EMS system aligning EMS agencies and providers to meet community-centered needs through clinical excellence, education, access and advocacy. These new protocols are one example of the multifaceted strategy we take in order to achieve our vision. These new protocols are intended to be the guidelines and framework of a team-based approach to prehospital care within our system.

These protocols are a “living document” and are subject to continuous review for the sake of providing providers with the most current evidence-based treatment. Updates to these protocols will be made as needed to maintain a current standard of care. We welcome your input and encourage suggestions in an effort to deliver the highest quality of prehospital health care possible.

Sincerely,

Kurt Bloomstrand, MD, FACEP, FAAEM

EMS Medical Director

East Central Illinois EMS

OSF HealthCare



# Preface

The protocol section is divided and color coded based on the level of prehospital provider licensure.

## Legend



## Definition

Emergency Medical Responder (EMR)



Emergency Medical Technician—Basic (EMT-Basic)



Emergency Medical Technician-Intermediate (EMT-I)



Paramedic Only



Medical Control



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# Universal Patient Care

## All Levels

### Scene Size-Up

1. Ensure scene safety – identify any hazards.
2. Use appropriate personal protective equipment (PPE).
  - a. Wear high-visibility, reflective apparel when deemed appropriate (e.g. operations at night or in darkness, on or near roadways).
3. Determine the number of patients.
4. Identify the mechanism of injury / nature of illness.
5. Call for additional resources if needed.
6. Consider declaration of Mass Casualty Incident (MCI), if needed.

### Initial Assessment / Primary Survey

*(Airway, Breathing, Circulation is cited below; although there are specific circumstances where Circulation, Airway, Breathing may be indicated such as cardiac arrest or major arterial bleeding)*

1. Obtain a general impression of the patient's condition.
2. **Airway**
  - a. Assess airway patency and open the airway as indicated (e.g. head-tilt chin-lift or jaw thrust).
  - b. Establish patent airway with cervical spine precautions, per the AIRWAY MANAGEMENT and SPINAL MOTION RESTRICTION Protocol.
  - c. For patients with laryngectomies or tracheostomies, remove all objects or clothing that may obstruct the opening of these devices, maintain the flow of prescribed oxygen and reposition the head and/or neck.
  - d. Evaluate mental status for ability to protect airway (patients with a GCS less than or equal to 8 are likely to require airway protection).
3. **Breathing**
  - a. Evaluate rate, breath sounds, accessory muscle use, retractions, patient positioning.
  - b. Monitor oxygen saturation and, if indicated, provide supplemental **OXYGEN** with a target of achieving 94-98% saturation for most acutely ill patients.
  - c. Apnea (not breathing) - go to the AIRWAY MANAGEMENT Protocol.
4. **Circulation**
  - a. Control any major external bleeding. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
  - b. Evaluate carotid and radial pulses. If no pulse go to CARDIAC ARREST Protocol
  - c. Evaluate perfusion by assessing skin color, temperature, condition and capillary refill.
  - d. Establish IV access and administer **IV FLUID** to maintain SBP > 90 mmHg. (**ILS/ALS ONLY**)
5. **Disability**
  - a. Assess Level of Consciousness:  
**A** – Alert; **V** – Responds to verbal; **P** – Responds to pain; **U** – Unresponsive
  - b. Evaluate gross motor and sensory function in all extremities.
  - c. Check blood glucose in patients with altered mental status and refer to appropriate protocol.
  - d. If acute stroke suspected, refer to STROKE Protocol.
6. **Exposure**
  - a. Rapid evaluation of entire body to identify injuries. Be considerate of patient modesty.
  - b. Prevent hypothermia (remove wet clothing and cover patient to prevent further heat loss).
7. **Critical Transport Decision** - Refer to INTERCEPT CRITERIA Protocol.
  - a. When indicated in protocol, call for ALS intercept if available.

# Universal Patient Care

## All Levels

### Secondary Survey

*The performance of the secondary survey should not delay transport in critical patients. Secondary surveys should be tailored to patient presentation and chief complaint.*

#### A. Focused History

##### SAMPLE History

Signs and Symptoms  
Allergies  
Medications  
Past medical history, injuries, illnesses  
Last meal/intake  
Events leading up to the injury and/or illness

##### OPQRST History

Onset of symptoms  
Provocation / Palliation  
Quality of pain  
Radiation of pain  
Severity of symptoms - pain scale  
Time of onset and circumstances around onset

#### B. Physical Assessment

1. Head
  - a. Pupils
  - b. Naso-oropharynx
  - c. Skull and scalp
2. Neck
  - a. Jugular venous distension
  - b. Tracheal position
  - c. Palpate the c-spine for tenderness. Refer to SPINAL MOTION RESTRICTION Protocol.
3. Chest
  - a. Breath sounds
  - b. Retractions
  - c. Chest wall deformity
4. Abdomen / Back
  - a. Flank / abdominal tenderness or bruising
  - b. Abdominal distension
5. Extremities
  - a. Edema
  - b. Pulses / capillary refill
  - c. Deformity
6. Neurologic status assessment
  - a. Mental status / orientation
  - b. Gross exam of motor strength and sensation in all four extremities



# Universal Patient Care

## All Levels

### C. Baseline Vital Signs

*(An initial full set of vital signs is required: pulse, blood pressure (manual preferred), respiratory rate, glucose, neuro status assessment)*

1. Neurologic status assessment involves establishing a baseline and then trending any change in patient neurologic status.
  - a. GCS and/or AVPU
2. Patients with cardiac or respiratory complaints:
  - a. Pulse oximetry
  - b. 12-lead ECG should be obtained within 10-minutes of patient contact with cardiac or suspected cardiac complaints. **(BLS - If Available) (ILS/ALS ONLY)**
  - c. Continuous cardiac monitoring **(ILS/ALS ONLY)**
  - d. Consider waveform capnography (essential for patients who require invasive airway management). **(ILS/ALS ONLY)**
3. Patients with altered mental status:
  - a. Check blood glucose
  - b. Consider waveform capnography (essential for patients who require invasive airway management). **(ILS/ALS ONLY)**
4. Stable patients should have at least two sets of pertinent vital signs. Ideally, one set should be taken shortly before arrival at receiving facility.
5. Critical patients should have pertinent vital signs frequently monitored.

# Universal Patient Care

## PEARLS

- Routine use of lights and sirens is not warranted.
- Even when lights and sirens are in use, always limit speeds to level that is safe for the emergency vehicle being driven and road conditions on which it is being operated.
- Be aware of legal issues and patient rights as they pertain to and impact patient care (e.g. patients with functional needs or children with special healthcare needs).
- Be aware of potential need to adjust management based on patient age and comorbidities, including medication dosages.
- Direct medical oversight should be contacted when mandated or as needed.
- Critical Patients: proactive patient management should occur simultaneously with assessment
  - a. Ideally, one provider should be assigned to exclusively monitor and facilitate patient-focused care.
  - b. Treatment and Interventions should be initiated as soon as practical, but should not impede extrication or delay transport to definitive care

# Abuse and Maltreatment

## Definitions

**Abuse/Maltreatment:** Any act or series of acts of commission or omission by a caregiver or person in a position of power over the patient that results in harm, potential for harm, or threat of harm to a patient.

**Child Maltreatment/Abuse:** Child maltreatment includes any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child. An act of commission (child abuse) is the physical, sexual or emotional maltreatment or neglect of a child or children. An act of omission (child neglect) includes, but is not limited to, failure to provide for the child's needs (e.g. physical, emotional, medical / dental, and educational neglect) and failure to supervise (e.g. inadequate supervision or safety precautions, lack of appropriate car seat use, and exposure to violent or dangerous environments).

**Human Trafficking:** When people are abducted or coerced into service and often transported across international borders. Signs may include, but are not limited to: patient with branding / tattoos and environmental clues such as padlocks and/or doorknobs removed on interior doors, and intact windows that are boarded up.

*\*\*Per NASEMSO EMS Clinical Guidelines V 2.2*

## All Levels

1. **UNIVERSAL PATIENT CARE.**
2. Assessment and history; note any discrepancies in history, environment or interaction.
3. Address and treat any obvious injuries or life-threatening issues per the appropriate protocol.
4. Attempt to preserve evidence whenever possible; however, the overriding concern should be providing appropriate emergency care to the patient.
5. If no medical emergency exists, the next priority is safe patient disposition / removal from the potentially abusive situation. Call law enforcement for assistance.
6. Do not confront suspected perpetrators of abuse / maltreatment. This can create an unsafe situation for EMS and for the patient.
7. For patients transported, report concerns to receiving facility and to the appropriate agency / hotline.

**The Illinois EMS Act (210 ILCS 50/3.230) and The Illinois Abused and Neglected Child Reporting Act (325 ILCS 5/4) requires all licensed EMS providers to report suspected cases of child abuse or neglect. To report, call the Child Abuse hotline at 1-800-25-ABUSE.**

**The Illinois EMS Act (210 ILCS 50/3.230) and The Illinois Elder Abuse and Neglect Act (320 ILCS 20/4) requires all licensed EMS providers to report suspected cases of elder abuse or neglect. To report, call the Elder Abuse hotline at 1-866-800-1409. For Nursing Home abuse/neglect, call 1-800-252-4343.**

# Abuse and Maltreatment

## PEARLS

- Clues to abuse or maltreatment can vary with age group of the patient and type of abuse.
- Not all abuse or maltreatment is physical.
- EMS role is to:
  - a. Document concerns.
  - b. Assess potentially serious injuries.
  - c. Disclose concerns to appropriate authorities.
  - d. Initiate help to get the patient into a safe situation.
  - e. Not to investigate or intervene beyond the steps above.
  - f. Leave further intervention to law enforcement personnel.
- Potential clues to abuse / maltreatment from caregivers or general environment:
  - a. Caregiver apathy about patient's current situation.
  - b. Caregiver overreaction to questions about situation.
  - c. Inconsistent histories from caregivers or bystanders regarding what happened.
  - d. Information provided by caregivers or patient that is not consistent with injury patterns.
  - e. Injuries not appropriate for patient's age or physical abilities (e.g. infants with injuries usually associated with ambulatory children, elders who have limited mobility with injury mechanisms inconsistent with their capabilities).
  - f. Caregiver not allowing adult patient to speak for themselves, or who appears controlling – pay special attention to patients who cannot communicate due to young age or language and/or cultural barriers.
  - g. Inadequate safety precautions or facilities where the patient lives and/or evidence of security measures that appear to confine the patient inappropriately.
- Potential clues to abuse / maltreatment that can be obtained from the patient:
  - a. Multiple bruises in various stages of healing.
  - b. Age-inappropriate behavior (e.g. adults who are submissive or fearful, children who act in a sexually inappropriate way).
  - c. Pattern burns, bruises, or scars suggestive of specific weaponry used.
  - d. Evidence of medical neglect for injuries or infections.
  - e. Unexplained trauma to genitourinary systems or frequent infections to this system.
  - f. Evidence of malnourishment and/or serious dental problems.

## KEY DOCUMENTATION ELEMENTS

- Meticulous documentation of any statements by the patient and/or parent / caregiver and any physical findings on the patient or the surroundings.
- Document findings by describing what you see (“2cm round burn to back”) and not ascribing possible causes (“burn consistent with cigarette”).
- Documentation of reporting suspected abuse to appropriate hotline.

## PERTINENT ASSESSMENT FINDINGS

- Identify potential life-threatening issues.
- Document thorough secondary survey to identify clues of potential abuse / maltreatment (See above)

## QUALITY METRICS

- Documentation of reporting suspected abuse.

# Airway Management

Transport to the closest appropriate hospital for airway stabilization when respiratory failure cannot be successfully managed in the prehospital setting.

## EMR & EMT-Basic

- UNIVERSAL PATIENT CARE**
  - Assess ABC's (Respiratory Rate, Effort, Adequacy)
  - Pulse Oximetry; EtCO<sub>2</sub> (if available)
- Establish airway patency
  - Open and maintain airway (i.e. head-tilt chin-lift or jaw thrust) with cervical spine precautions, per the SPINAL MOTION RESTRICTION Protocol
  - Suction as needed
  - Clear foreign body obstructions per the FOREIGN BODY AIRWAY OBSTRUCTION Protocol
- Administer **OXYGEN** with a target of achieving 94-98% saturation for most acutely ill patients.
- Consider inserting an oropharyngeal (OPA) or nasopharyngeal (NPA) airway adjunct as indicated.
  - OPA contraindicated with intact gag reflex.
  - NPA contraindicated in patients with known or suspected head injuries.
- Assist ventilations with a bag-valve-mask (BVM) and supplemental oxygen as needed.
  - Two-person, two-thumbs-up BVM ventilation is more effective than one-person technique and should be used when additional providers are available.
- If patient has a tracheostomy tube, refer to RESPIRATORY DISTRESS WITH A TRACHEOSTOMY TUBE / VENTILATOR Protocol.
- For apnea / respiratory failure or impending respiratory failure with impaired or absent gag reflex consider a system approved BLIND INSERTION AIRWAY DEVICE (BIAD) (i.e. i-gel®).

## EMT-Intermediate

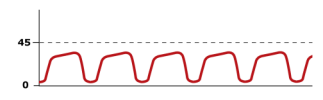

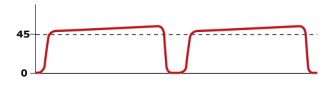
- Continue **EMR / BLS TREATMENT**.
- For adults in severe respiratory distress secondary to pulmonary edema / CHF, COPD, asthma, pneumonia, near drowning or undifferentiated respiratory distress, consider use of CPAP.
- When less-invasive methods (BVM, BIAD) are ineffective, consider OROTRACHEAL INTUBATION.
  - EtCO<sub>2</sub> / waveform capnography is mandatory for all intubations.
  - Video laryngoscopy may enhance intubation success rates and should be used when available.
  - Limit of 2 total intubation attempts per patient.
    - Evaluate reason for failure and change technique or person attempting to increase chance of success.
- If managing a breathing patient's airway, determine if the patient is relaxed / flaccid enough for intubation. If not, consider employing the MEDICATION ASSISTED INTUBATION Protocol.
- If successful intubation, perform post-intubation management procedures including:
  - Verification of proper placement with waveform capnography, absent gastric sounds, and bilateral breath sounds.
  - Note the centimeter marking of the ET tube adjacent to the teeth or lips.
  - Secure the ET tube with a commercial device or tape.
- Ventilate with minimal volume in order to see chest rise, approximately 6-7 mL/kg Ideal Body Weight.
  - Avoid hyperventilation. Maintain EtCO<sub>2</sub> of 35-45 mmHg
- Continuously monitor placement with waveform capnography during treatment and transport.

Protocol Continues 

# Airway Management

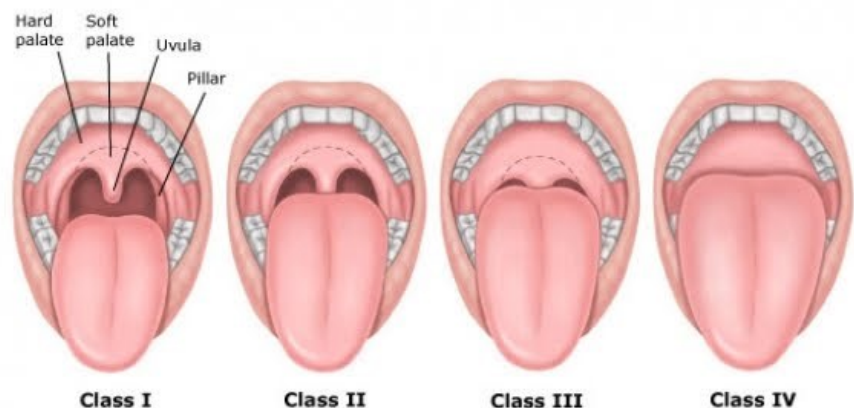
## Paramedic

1. When a “can’t ventilate, can’t intubate” situation occurs and ALL attempts to manage the airway and ventilate the patient have failed, the paramedic should utilize a surgical airway device. Only providers that are trained to do so should perform a cricothyroidotomy using an EMS System approved cricothyroidotomy device or technique. Refer to CRICOTHYROIDOTOMY (Pertrach® or QuickTrach® ) Procedure.
2. Once the device is successfully inserted follow the post intubation management procedure above and secure the device according to the manufacturers recommendations. Ventilate with 100% oxygen.

EtCO <sub>2</sub>		
Value	Waveform	State of ventilation
Less than 35 mmHg Hypocapnia		Hyperventilation. Consider slowing ventilator rate
35 - 45 mmHg Normal		Usually indicates adequate ventilation
Greater than 45 mmHg Hypercapnia		Hypoventilation. Consider increasing ventilator rate, assess adjunct for occlusion

## Mallampati Classification

- **Class 1:** Full visibility of tonsils, uvula and soft palate
- **Class 2:** Visibility of hard and soft palate, upper portion of tonsils and uvula
- **Class 3:** Soft and hard palate and base of the uvula are visible (*predicted difficult*)
- **Class 4:** Only Hard Palate visible (*predicted difficult*)



# Airway Management

## PEARLS

- Avoid excessive pressures or volumes during BVM. Ventilate with minimal volume to see chest rise, approximately 6-7 mL/kg ideal body weight
- Avoid endotracheal intubation, unless less invasive methods fail, since it can be associated with aspiration, oral trauma, worsening of cervical spine injury, malposition of the ET tube (right mainstem intubation, esophageal intubation), or adverse effects of sedation, especially in children.
- An *Intubation Attempt* is defined as passing the laryngoscope blade past the teeth.
- **Bag-Valve-Mask (BVM):** Appropriately-sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin
  - a. Ventilation should be delivered with only sufficient volume to achieve chest rise
  - b. Ventilation rate:
    - i. During CPR with an advanced airway, ventilation rate should be 10 breaths per minute, one breath every 10 compressions (or one breath every 6 seconds). Ideally ventilations should be on the upstroke between two chest compressions.
    - ii. In adults who are not in cardiac arrest, ventilate at rate of 12 breaths per minute.
    - iii. In children who are not in cardiac arrest, ventilating breaths should be delivered over one second, with a two second pause between breaths (20 breaths/minute).
- **Orotracheal intubation:**
  - a. Approximate depth of insertion = (3) x (endotracheal tube size).
  - b. In addition to preoxygenation, apneic oxygenation (high-flow oxygen by nasal cannula) may prolong the period before hypoxia during an intubation attempt.
  - c. Appropriate attention should be paid to adequate preoxygenation to avoid peri-intubation hypoxia and subsequent cardiac arrest.
  - d. Prompt suctioning of soiled airways before intubation attempt may improve first pass success.
  - e. Confirm successful placement with waveform capnography. Less optimal methods of confirmation include bilateral chest rise, bilateral breath sounds, and maintenance of adequate oxygenation. Color change on EtCO<sub>2</sub> is less accurate than clinical assessment, and wave-form capnography is superior. Misting observed in the tube is not a reliable method of confirmation. Visualization with video laryngoscopy, when available, may assist in confirming placement when unclear due to capnography failure or conflicting information.

## KEY DOCUMENTATION ELEMENTS

- Initial vitals signs and physical exam
- Size of equipment used
- Number of intubation attempts
- Reassessment with repeat vital signs
- Document EtCO<sub>2</sub> value and record capnography wave initially after intubation, with each set of vital signs, when patient is moved and at the time of patient transfer in the ED

## PERTINENT ASSESSMENT FINDINGS

- Complete respiratory and airway assessment
- Ongoing assessment is critical when an airway device is in place
- Acute worsening of respiratory status or evidence of hypoxemia can be secondary to displacement or obstruction of the airway device, pneumothorax or equipment failure

## QUALITY METRICS

- First pass intubation success rate
- Documentation of post-intubation confirmation (EtCO<sub>2</sub>, absent gastric sounds, bilateral breath sounds)
- Waveform capnography used for initial confirmation and continuous monitoring during transport with advanced airway

# Airway Management

Intentionally Left  
Blank

Adult General



# Determination of Death / Withholding Resuscitative Efforts

All clinically dead patients will receive all available resuscitative efforts including cardiopulmonary resuscitation (CPR) unless contraindicated by one of the exceptions defined below.

## All Levels

1. A person is presumed *Dead on Arrival (DOA)* when all “signs of death” are present and at least one associated “factor of death” is present.

<b>SIGNS OF DEATH</b> <b>(ALL must be present)</b>	<b>FACTORS OF DEATH</b> <b>(At least one must be present)</b>
<ul style="list-style-type: none"> <li>• Unresponsiveness</li> <li>• Apnea</li> <li>• Pulseless (carotid &amp; femoral by 2 providers)</li> <li>• No obvious signs of life (<i>spontaneous movement, ECG activity or AED shockable rhythm, or pupillary response</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• Lividity</li> <li>• Rigor mortis</li> <li>• Decapitation</li> <li>• Decomposition</li> <li>• Transection of the torso</li> <li>• Incineration</li> <li>• Injuries incompatible with life:                             <ul style="list-style-type: none"> <li>- massive crush injury</li> <li>- complete exsanguination</li> <li>- severe displacement of brain matter</li> </ul> </li> <li>• Massive blunt or penetrating trauma</li> </ul>

2. Do not initiate resuscitation in the following:
  - Do Not Resuscitate orders:** No resuscitation efforts should be initiated when the person or family has evidence of a valid Do Not Resuscitate (DNR) order in hand.
  - Scene safety:** The physical environment is not safe for the EMS providers to enter.
3. If any of the findings are different than those described above, clinical death is not confirmed and resuscitative measures should be immediately initiated or continued.
4. Contact **MEDICAL CONTROL** to confirm death.
5. Once death confirmation has been made by medical control and resuscitation will not be attempted:
  - a. Immediately notify the coroner or medical examiner's office.
  - b. Do NOT leave a body unattended. EMS should remain on scene until the coroner arrives or law enforcement is on scene.
  - c. Do NOT remove any property from the body or the scene.
  - d. Never transport / move a body without permission from the coroner's office except for assessment or its protection.

# Determination of Death / Withholding Resuscitative Efforts

## PEARLS

- In cases where the patient's status is unclear and the appropriateness of withholding resuscitation efforts is questioned, EMS personnel should initiate CPR immediately and then contact direct medical oversight.
- For scene safety and/or family wishes, provider may decide to implement CPR even if all the criteria for death are met.
- At a likely crime scene, disturb as little potential evidence as possible.
- Medical cause or traumatic injury or body condition clearly indicating biological death (irreversible brain death), limited to:
  - a. Decapitation: the complete severing of the head from the remainder of the patient's body.
  - b. Decomposition or putrefaction: the skin is bloated or ruptured, with or without soft tissue sloughed off. The presence of at least one of these signs indicated death occurred at least 24 hours previously.
  - c. Transection of the torso: the body is completely cut across below the shoulders and above the hips through all major organs and vessels. The spinal column may or may not be severed.
  - d. Incineration: 90% of body surface area with full thickness burns as exhibited by ash rather than clothing and complete absence of body hair with charred skin.
  - e. Injuries incompatible with life (such as massive crush injury, complete exsanguination, severe displacement of brain matter).
  - f. In blunt and penetrating trauma, if the patient is apneic, pulseless, and without other signs of life upon EMS arrival including, but not limited to spontaneous movement, ECG activity, or pupillary response.

## KEY DOCUMENTATION ELEMENTS

- Clinical / situational details that may be available from bystanders / caregivers
- Documentation of details surrounding decision to determine death
  - Signs / Factors of death
  - Time of contact with Medical Control
  - Time of death confirmation
  - Name of Physician giving death confirmation

## PERTINENT ASSESSMENT FINDINGS

- Signs of death
- Factors of death

## QUALITY METRICS

- Documentation of details surrounding determination of death and time of death confirmation.

# Functional Needs / Special Needs Populations

## Criteria

Patients who are identified by the World Health Organization's International Classification of Functioning, Disability, and Health that have experienced a decrement in health resulting in some degree of disability. According to the U.S. Department of Health and Human Services, this includes, but is not limited to, individuals with physical, sensory, mental health, and cognitive and/or intellectual disabilities affecting their ability to function independently without assistance.

## All Levels

1. Identify the functional need by means of information from the patient, the patient's family, bystanders, medic alert bracelets or documents, or the patient's adjunct assistance devices.
2. The physical examination should not be intentionally abbreviated, although the manner in which the exam is performed may need to be modified to accommodate the specific needs of the patient.
3. Medical care should not intentionally be reduced or abbreviated during the triage, treatment, and transport of patients with functional needs, although the manner in which the care is provided may need to be modified to accommodate the specific needs of the patient.
4. For patients with communication barriers (language or sensory), it may be desirable to obtain secondary confirmation of pertinent data (e.g. allergies) from the patient's family, interpreters, or written or electronic medical records. The family members can be an excellent source of information and the presence of a family member can have a calming influence on some of these patients.

Assistance Adjuncts. Examples of devices that facilitate the activities of daily living for the patient with functional needs include, but are not limited to:

- a. Extremity prostheses
- b. Hearing aids
- c. Magnifiers
- d. Tracheostomy speaking valves
- e. White or sensory canes
- f. Wheelchairs or motorized scooters

Service Animals - As defined by the American Disabilities Act, "any guide dog, signal dog, or other animal individually trained to do work or perform tasks for the benefit of an individual with a disability, including, but not limited to guiding individuals with impaired vision, alerting individuals with impaired hearing to intruders or sounds, providing minimal protection or rescue work, pulling a wheelchair, or fetching dropped items."

- a. Service animals are not classified as a pet and should, by law, always be permitted to accompany the patient.

# Functional Needs / Special Needs Populations

## PEARLS

- Communication Barriers:
  - a. Language Barriers:
    - i. Expressive and/or receptive aphasia
    - ii. Nonverbal
    - iii. Fluency in a different language than that of the EMS professional
    - iv. Examples of tools to overcome language barriers include:
      - 1. Transport of an individual who is fluent in the patient's language along with the patient to the hospital
      - 2. Medical translation cards
      - 3. Telephone-accessible services with live language interpreters
      - 4. Methods through which the patient augments his / her communication skills (e.g. eye blinking, nodding) should be noted, utilized as able, and communicated to the receiving facility
      - 5. Electronic applications for translation
  - b. Sensory Barriers:
    - i. Visual impairment
    - ii. Auditory impairment
    - iii. Examples of tools to overcome sensory barriers include:
      - 1. Braille communication card
      - 2. Sign language
      - 3. Lip reading
      - 4. Hearing aids
      - 5. Written communication
- Physical Barriers:
  - a. Ambulatory impairment (e.g. limb amputation, bariatric)
  - b. Neuromuscular impairment
- Cognitive Barriers:
  - a. Mental illness
  - b. Developmental challenge or delay

## KEY DOCUMENTATION ELEMENTS

- Document all barriers of care
- Document specific physical barriers in the appropriate exam elements
- Document any language or sensory barriers and assistance adjuncts

## PERTINENT ASSESSMENT FINDINGS

- Barriers (*see above*)

## QUALITY METRICS

- Documentation of barriers of care.

# Intercept Criteria

## Criteria

The appropriate ALS vehicle will be dispatched to intercept with a BLS or ILS unit / team when:

1. The BLS or ILS unit or team requests intercept or;
2. The ECRN or MD at the receiving hospital deems it necessary based upon the condition of the patient or;
3. The patient meets one or more of the following (including but not limited to):

### BLS Intercept Criteria:

- a. Active seizures
- b. Anaphylaxis
- c. Cardiopulmonary Arrest
- d. Chest Pain (Acute Coronary Syndrome)
- e. Diabetic Emergencies
- f. Drowning / Near drowning
- g. Electrical injuries (High or Low)
- h. Obstetrical emergencies (i.e. prolapsed cord, abnormal presentations)
- i. Obstructed airways that cannot be cleared
- j. Respiratory Arrest / Distress
- k. Severe traumatic injuries
- l. Signs/symptoms of shock (i.e. tachycardia, tachypnea, abnormal skin signs, hypotension)
- m. Symptomatic overdose or poisoning
- n. Any patient situation that higher level of care may benefit the patient

### ILS Intercept Criteria:

- a. Cardiogenic shock
  - b. Obstructed airways that cannot be cleared
  - c. Cardiac tamponade
  - d. Severe traumatic injuries
  - e. Symptomatic overdose or poisoning
  - f. Any patient situation that higher level of care may benefit the patient
4. The decision to utilize an intercept may be influenced by various factors such as:
    - a. Geographical location
    - b. Improvement of patient condition
    - c. Refusal of higher level of care by patient with appropriate documentation

# Intercept Criteria

**Intentionally Left  
Blank**

# Medication Assisted Intubation

## Criteria

- Imminent respiratory arrest
- Patient unable to protect their own airway
- Impending airway compromise due to severe edema secondary to trauma, allergic process, or burns.
- Glasgow Coma Score <8

## Paramedic

### Pre-Intubation

1. Refer to the AIRWAY MANAGEMENT Protocol.
2. Preoxygenate with 100% oxygen via Bag-Valve Mask (BVM).
3. Make sure all intubation equipment is prepared and medication is ready.
4. Prepare suction equipment.
5. Have BIAD and surgical airway device equipment available for back-up.

### Intubation

1. Refer to the AIRWAY MANAGEMENT Protocol and OROTRACHEAL INTUBATION Procedure.
2. Continue to assist ventilations with 100% oxygen during this procedure.
3. Administer medications as long as BP allows (SBP > 90 mmHg or MAP > 65 mmHg):
  - a. **MIDAZOLAM 0.1 mg/kg IV/IO** (maximum 10mg).
  - b. **FENTANYL 1 mcg/kg IV/IO** (maximum initial dose 100 mcg); may repeat x 1 after 3-5 minutes at 0.5 mcg/kg (maximum second dose 50 mcg)
4. Spray posterior pharynx with **BENZOCAINE SPRAY** (1-2 second spray; may repeat once after 30 seconds if needed).
5. Attempt oral or in-line intubation per AIRWAY MANAGEMENT Protocol.

### Post Intubation

1. If after intubation patient exhibits movement that might lead to extubation, administer **FENTANYL** as long as BP allows (SBP > 90 mmHg or MAP > 65 mmHg). If the initial medication is not effective, then use **MIDAZOLAM** at the appropriate dose:
  - a. **FENTANYL 1 mcg/kg IV/IO** (maximum initial dose 100 mcg); may repeat x 1 after 3-5 minutes at 0.5 mcg/kg (maximum second dose 50 mcg)
  - b. **MIDAZOLAM 0.05mg/kg IV/IO every 3-5 minutes** as needed (total maximum dose 10mg).
2. Continuous monitoring of patient with cardiac monitor, continuous SpO2 and capnography is required.



**Medical Control**



3. If more sedation or analgesia is needed, contact **Medical Control** for additional orders.

# Medication Assisted Intubation

## PEARLS

- Avoid endotracheal intubation, unless less invasive methods fail, since it can be associated with aspiration, oral trauma, worsening of cervical spine injury, malposition of the ET tube (right mainstem intubation, esophageal intubation), or adverse effects of sedation.
- Once a successful intubation has been performed, obstruction or displacement of the tube can have further deleterious effects on patient outcome
  - a. Tubes should be secured with either a commercial tube holder or tape.
- Use continuous waveform capnography to detect end-tidal carbon dioxide (EtCO<sub>2</sub>). This is an important adjunct in the monitoring of patients with respiratory distress, respiratory failure, and those treated with positive pressure ventilation. It should be used as the standard to confirm SGA, EGD, and endotracheal tube placement.
- Avoid excessive pressures or volumes during BVM.
- An intubation attempt is defined as passing the laryngoscope blade past the teeth.

## KEY DOCUMENTATION ELEMENTS

- Initial vital signs and physical exam
- Approximate patient weight
- Drug allergies
- Medication administered and dose
- Size of equipment used
- Number of intubation attempts
- Reassessment with repeat vital signs
- Document EtCO<sub>2</sub> value and record capnograph wave initially after intubation, with each set of vital signs, when patient is moved and at the time of patient transfer in the ED

## PERTINENT ASSESSMENT FINDINGS

- Complete respiratory and airway assessment
- Ongoing assessment is critical when an airway device is in place
- Acute worsening of respiratory status or evidence of hypoxemia can be secondary to displacement or obstruction of the airway device, pneumothorax or equipment failure

## QUALITY METRICS

- Automatic review by EMS Medical Director
- First pass intubation success rate
- End-tidal CO<sub>2</sub> / Capnography performed on any endotracheal intubation
- Appropriate weight-based dosing of medications



# Pain Management

## History

- Age
- Location
- Duration
- Severity (1-10)
- Past medical history
- Medications
- Drug allergies

## Signs and Symptoms

- Severity (pain scale)
- Quality (sharp, dull, etc.)
- Radiation
- Relation to movement / respiration
- Increased with palpation to area

## Differential

- Per the specified protocol
- Musculoskeletal
- Visceral (abdominal)
- Cardiac
- Pleural / Respiratory
- Neurogenic
- Renal (colic)

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. Determine pain score and continue to monitor / trend score.
3. Place patient in a position of comfort.
4. Apply ice packs and/or splints for pain secondary to trauma.
5. Verbally reassure patient to control anxiety.
6. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. For *Mild* or *Moderate* pain consider: **ACETAMINOPHEN 1000 mg PO.**
  - a. **Contraindicated** in patients with allergy or known liver failure.
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT.**
2. For *Moderate* pain consider: **KETOROLAC 30 mg IM or 15 mg IV** (no repeat dose)
  - a. **Contraindicated** in patients with NSAID allergy, aspirin-sensitive asthma, renal insufficiency, pregnancy or known peptic ulcer disease.
3. For *Severe* pain consider:  
**MORPHINE SULFATE 5 mg slow IV/IO or 10 mg IM.** May repeat IV/IO dose x 1 after 15 minutes if needed.  
**-OR-**  
**FENTANYL 1 mcg/kg IV/IO/IM/IN** (max initial dose 100 mcg); Recommended initial dose: **50 mcg.** May repeat x 1 after 10-15 minutes at 0.5 mcg/kg (maximum second dose 50 mcg).
  - a. IV/IO is a slow push over 2-3 minutes.
4. Continuous monitoring of patient with cardiac monitor, continuous SpO2 and capnography is required.

# Pain Management

## PEARLS

- All patients should have drug allergies identified prior to administration of pain medication.
- Pain severity (0 - 10) should be recorded before and after analgesic medication administration and upon arrival at destination.
- Opioids **contraindicated** in patients with GCS less than 15, hypotension, identified medication allergy, hypoxia (oxygen saturation less than 90%) after maximal supplemental oxygen therapy, or signs of hypoventilation.
- Use of splinting techniques and application of ice should be done to reduce the total amount of medication used to keep the patient comfortable.
- Patients with acute abdominal pain should receive analgesic interventions – Use of analgesics for acute abdominal pain does not mask clinical findings or delay diagnosis.

Verbal Descriptor Scale												
	0	1	2	3	4	5	6	7	8	9	10	
	No Pain	Mild			Moderate			Severe				
Descriptive Scale	Alert Smiling		No Humor Serious, Flat		Furrowed Brow Pursed Lips Breath Holding		Wrinkled Nose Raised Upper Lip Rapid Breathing		Slow Blink Open Mouth		Eyes Closed Moaning Crying	
	No Pain		Can be Ignored		Interferes with Tasks		Interferes with Concentration		Interferes with Basic Needs		Bed Rest Required	
Activity Tolerance Scale	No Pain		Can be Ignored		Interferes with Tasks		Interferes with Concentration		Interferes with Basic Needs		Bed Rest Required	

## KEY DOCUMENTATION ELEMENTS

- Vitals signs
- Drug allergies
- Initial pain scale
- Medication administered and dose
- Reassessment with repeat vital signs and pain scale

## PERTINENT ASSESSMENT FINDINGS

- Mental status (GCS and pain level)
- Respiratory system (chest rigidity)
- Gastrointestinal (assess for tenderness, rebound, guarding and nausea)

## QUALITY METRICS

- Correct dose of pain medication
- Pain assessment documented

# Patient Refusal

## Criteria

- Patient refuses treatment, transport or requests transport to facility other than closest, most appropriate facility.
- Patient is > 18 years old, or an emancipated minor.
- Patient is < 18 years old, and one of the following:
  - a. Legal guardian is present.
  - b. Legal guardian contacted from the scene and consents to refusal.
- Patient or legal guardian is competent and has the mental capacity to make an informed decision.
  - a. Patient is alert, oriented and has the ability to understand the circumstances surrounding his / her illness or impairment, as well as the possible risks associated with refusing treatment and/or transport.
  - b. The individual's judgement must also not be significantly impaired by illness, injury or drugs / alcohol intoxication.
  - c. The "Quick Confusion Scale" was administered and patient received a score of greater than 11.
- Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having decision-making capacity and may not decline transport to a medical facility.

## All Levels

1. Ensure all refusal criteria are met in accordance with the "Refusal of Service" Policy.
2. Obtain a complete set of vital signs and complete an initial assessment, paying particular attention to the individual's neurologic and mental status.
3. Determine the individual's capacity to make a valid judgement concerning the extent of his / her illness or injury. Utilize the "Quick Confusion Scale" to help make determination of patients capacity. If the EMS provider has doubts about whether the individual has the mental capacity to refuse or if the patient lacks capacity, the EMS provider should contact Medical Control
4. Ask patient or guardian to explain reasons for refusal.
5. Clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care.
6. If patient or guardian does not demonstrate understanding risks of refusal, initiate care under implied consent.
7. If refusal represents a significant risk to the patient, based upon mechanism of injury or severity of illness, contact Medical Control for advice.
8. Perform appropriate medical care with consent of the individual.
9. If all criteria are met for refusal and risks of refusal have been explained, with reasonable understanding demonstrated by patient or guardian, refusal can be accepted and patient or guardian should sign refusal form.
10. If patient or guardian is unable or unwilling to sign, document circumstances.
11. Contact Medical Control as necessary.
12. Complete the patient care report clearly documenting the initial assessment findings and the discussions with all involved individuals regarding the possible consequences of refusing additional prehospital care and/or transportation.

# Patient Refusal

## PEARLS

- Refer to the “*Refusal of Service*” Policy.
- An adult or emancipated minor who has demonstrated possessing sufficient mental capacity for making decisions has the right to determine the course of his / her medical care, including the refusal of care. These individuals must be advised of the risks and consequences resulting from refusal of medical care.
- An individual determined to lack decision-making capacity by EMS providers should not be allowed to refuse care against medical advice or to be released at the scene. Mental illness, drugs, alcohol intoxication, or physical / mental impairment may significantly impair an individual’s decision-making capacity. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having demonstrated sufficient decision-making capacity.
- The determination of decision-making capacity may be challenged by communication barriers or cultural differences.
- EMS providers should not put themselves in danger by attempting to treat and/or transport an individual who refuses care.
- Always act in the best interest of the patient – EMS providers, with the support of direct medical oversight, must strike a balance between abandoning the patient and forcing care.

## KEY DOCUMENTATION ELEMENTS

- Document patient capacity with:
  - Any and all barriers to patient care
  - Physical Exam
  - Mental Status / Neuro Exam (AVPU & GCS)
  - Quick Confusion Scale
  - Alcohol and drug use indicators
  - Blood glucose level
- Any assessments and treatments performed
- Patient age
- For minors: guardian name, contact and relationship
- Patient was advised of risks / benefits of refusal / treatment
- Patient voices understanding of risks of refusal
- Patient was advised that they can change their mind and re-contact EMS at anytime
- Reason for patient refusing care. A quotation of the patient’s actual words is best.
- Medical Control Contact

## PERTINENT ASSESSMENT FINDINGS

- Decision-Making Capacity
  - a. An individual who is alert, oriented, and has the ability to understand the circumstances surrounding his / her illness or impairment, as well as the possible risks associated with refusing treatment and/or transport, typically is considered to have decision-making capacity.
  - b. The individual’s judgment must also not be significantly impaired by illness, injury or drugs / alcohol intoxication. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having decision-making capacity and may not decline transport to a medical facility.
- Quick Confusion Scale

## QUALITY METRICS

- Patient decision-making capacity was determined and documented
- Guardians contacted or efforts to contact the guardians for minor patients who are not or cannot be confirmed to be emancipated

# Radio Report

## All Levels

1. Unit must identify call letters, level of service and city of origin.
  - a. Non-transport agencies may use MERCI, local radio frequency or cellular phone to communicate with Medical Control.
  - b. Report should be called to receiving facility on all transports.
2. Standard report:
  - a. ETA
  - b. Age and sex
  - c. Mechanism of injury / Nature of illness
  - d. Pertinent findings
  - e. Vital Signs
  - f. Patient care / interventions
3. Orders must be confirmed when received from Medical Control by repeating them verbatim back to Medical Control for verification and clearly documented in the patient care report.
4. In the event of communications system failure, protocols may be used as listed, including Medical Control considerations. Protocol usage must be documented by risk screen and submitted to the EMS system office within 24 hours.
5. In the event that a provider deviates from these protocols, a completed risk screen with written explanation must be completed and submitted to the EMS Medical Director within 24 hours of the occurrence.

# Radio Report

## PEARLS

- Radio communications is a vital component of prehospital care. Information reported should be concise and provide an accurate description of the patient's condition as well as treatment rendered.
- Early and timely notification of Medical Control or the receiving facility is essential for prompt care to be delivered by all involved.
- Whenever possible, the EMS provider responsible for the highest level of direct patient care should call in the report.

## KEY DOCUMENTATION ELEMENTS

- Document report given to receiving hospital
- Document any orders given verbatim as well as name of ordering physician

## PERTINENT ASSESSMENT FINDINGS

## QUALITY METRICS

# Termination of Resuscitation

## EMT-Intermediate & Paramedic

1. Contact **MEDICAL CONTROL** to consider Termination of Resuscitation for any of the following:

### MEDICAL

- Patient is at least 18 years of age.
- Patient is in cardiac arrest at the time of arrival of advanced life support.
  - i. No pulse (carotid and femoral confirmed by two EMS providers)
  - ii. No respirations
  - iii. No evidence of meaningful cardiac activity (e.g. asystole or wide complex PEA less than 60 bpm, no heart sounds)
- All three of the following are true:
  - i. Arrest not witnessed by EMS personnel.
  - ii. No Return of Spontaneous Circulation (ROSC) after at least 20 minutes of high quality CPR / ACLS with a patent airway and EtCO<sub>2</sub> < 10 mmHg.
  - iii. No defibrillation delivered / non-shockable rhythm.
- No evidence or suspicion of hypothermia.
- All EMS personnel involved in the patient's care agree that discontinuation of the resuscitation is appropriate.
- Contact **MEDICAL CONTROL** to consider termination of resuscitation if patient meets above criteria.
- For patients with narrow complex PEA with a rate above 40 or refractory and recurrent ventricular fibrillation / ventricular tachycardia, consider continuation of resuscitation and transport.

### TRAUMA

- Patient is at least 18 years of age.
  - Resuscitation efforts may be terminated in any blunt trauma patient who, upon EMS arrival, is found to be pulseless, apneic and without organized ECG activity.
  - Resuscitation efforts may be terminated in any penetrating trauma patient who, upon EMS arrival, is found to be pulseless, apneic and without other signs of life, including spontaneous movement, ECG activity and pupillary response
  - Cardiopulmonary arrest patients in whom mechanism of injury does not correlate with clinical condition, suggesting a non-traumatic cause of arrest, should have standard ALS resuscitation initiated. Refer to CARDIAC ARREST Protocol.
  - All EMS personnel involved in the patient's care agree that discontinuation of the resuscitation is appropriate.
  - Contact **MEDICAL CONTROL** to consider termination of resuscitation if patient meets above criteria.
2. If transport is initiated, resuscitation must be continued until arrival at the receiving hospital.
  3. Once termination of resuscitation orders have been received and death confirmation has been made by medical control:
    - a. Immediately notify the coroner or medical examiners office.
    - b. Do NOT leave a body unattended. EMS should remain on scene until the coroner arrives or law enforcement is on scene.
    - c. Do NOT remove any property from the body or the scene.
    - d. Never transport / move a body without permission from the coroner's office except for assessment or its protection.

# Termination of Resuscitation

## PEARLS

- When there is no response to prehospital cardiac arrest treatment, it is acceptable and often preferable to cease futile resuscitation efforts in the field.
- Recent evidence has shown that, in order to capture over 99% of potential survivors from medical cardiac arrest (especially VF and pulseless VT arrests), resuscitation should be continued for approximately 40 minutes. This does not imply, however, that all resuscitations should continue this long (e.g. asystolic rhythms)
- Logistical factors should be considered, such as collapse in a public place, family wishes, and safety of the crew and public.
- Survival and functional neurologic outcomes are unlikely if ROSC is not obtained by EMS. It is dangerous to crew, pedestrians, and other motorists to attempt to resuscitate a patient during ambulance transport.
- Quantitative end-tidal carbon dioxide measurements of less than 10 mmHg or falling greater than 25% despite resuscitation indicates a poor prognosis and provide additional support for termination
- In patients with cardiac arrest, prehospital resuscitation is initiated with the goal of returning spontaneous circulation before permanent neurologic damage occurs. In most situations, ALS providers are capable of performing an initial resuscitation that is equivalent to an in-hospital resuscitation attempt, and there is usually no additional benefit to emergency department resuscitation in most cases.
- CPR that is performed during patient packaging and transport is much less effective than CPR done at the scene. Additionally, EMS providers risk physical injury while attempting to perform CPR in a moving ambulance while unrestrained. In addition, continuing resuscitation in futile cases places other motorists and pedestrians at risk, increases the time that EMS crews are not available for another call, impedes emergency department care of other patients, and incurs unnecessary hospital charges. Lastly, return of spontaneous circulation is dependent on a focused, timely resuscitation. The patient in arrest should be treated as expeditiously as possible, including quality, uninterrupted CPR and timely defibrillation as indicated.
- When cardiac arrest resuscitation becomes futile, the patient's family should become the focus of the EMS providers. Families need to be informed of what is being done, and transporting all cardiac arrest patients to the hospital is not supported by evidence and inconveniences the family by requiring a trip to the hospital where they must begin grieving in an unfamiliar setting. Most families understand the futility of the situation and are accepting of ceasing resuscitation efforts in the field.

## KEY DOCUMENTATION ELEMENTS

- Documentation of all details / criteria surrounding decision to terminate resuscitation
  - Signs / Factors of death
  - Time of contact with Medical Control
  - Time of death confirmation
  - Name of Physician giving death confirmation

## PERTINENT ASSESSMENT FINDINGS

- Pulse
- Respirations
- Neuro status
- ECG activity
- EtCO<sub>2</sub>

## QUALITY METRICS

- Time to CPR
- Time to AED / Defibrillator application if applicable and/or defibrillation
- Review of CPR quality
- Duration of resuscitative efforts
- Review of biometric data / CPR quality if available
- Appropriateness of termination



# Abdominal Pain

## History

- Age
- Past Medical / Surgical History
- Medications
- Onset
- Palliation / Provocation
- Quality (crampy, constant, sharp, dull, etc.)
- Region / Radiation / Referred
- Severity (0-10)
- Time (duration / repetition)
- Fever
- Last oral intake
- Last bowel movement / Emesis
- Menstrual history (pregnancy)

## Signs and Symptoms

- Pain (location / migration)
- Tenderness
- Nausea
- Vomiting
- Diarrhea
- Dysuria
- Constipation
- Vaginal bleeding / discharge
- Pregnancy

## Differential

- Pneumonia or pulmonary embolus
- Liver (hepatitis, CHF)
- Peptic Ulcer Disease / Gastritis
- Gallbladder
- Myocardial Infarction
- Pancreatitis
- Kidney stone
- Abdominal Aortic Aneurysm
- Appendicitis
- Bladder / Prostate disorder
- Pelvic (PIC, Ectopic pregnancy, Ovarian cyst)
- Splenomegaly
- Diverticulitis
- Bowel obstruction
- Gastroenteritis (infectious)

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. Maintain the patient NPO (nothing by mouth).
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. Consider management of nausea/vomiting per the NAUSEA / VOMITING Protocol.
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue EMR / BLS TREATMENT.
2. Establish IV access.
3. Consider management of nausea/vomiting per the NAUSEA / VOMITING Protocol.
4. Consider management of pain per the PAIN MANAGEMENT Protocol.
5. If signs of shock refer to SHOCK Protocol.

# Abdominal Pain

## PEARLS

- Abdominal pain / nausea / vomiting is a common finding associated with acute coronary syndrome. Consider obtaining a 12-lead ECG when appropriate.
- Assess for life-threatening causes of abdominal pain, which may include:

### Ischemic, necrotic, or perforated bowel

- ◇ Severe tenderness
- ◇ Abdominal pain with motion or “jiggling” of abdomen
- ◇ Fever
- ◇ Bloody stool
- ◇ Nausea and vomiting
- ◇ Possible absence of passage of stool or gas
- ◇ Abdominal distention, with possible tympany to percussion

### Dissecting or Ruptured Abdominal Aortic Aneurysm

- ◇ Unequal femoral or distal lower extremity pulses
- ◇ “Pulsatile” abdominal mass
- ◇ Associated back pain and/or chest pain
- ◇ Known history of AAA

### Ruptured ectopic pregnancy

- ◇ Vaginal bleeding
- ◇ Recently diagnosed pregnancy

### Appendicitis

- ◇ Focal right lower quadrant tenderness
- ◇ RLQ tenderness during palpation of LLQ (Rovsing’s sign)
- ◇ Peri-umbilical or diffuse abdominal tenderness with palpation or “jiggling” of the abdomen/pelvis
- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Lack of appetite

### Acute Cholecystitis

- ◇ Right upper quadrant or epigastric tenderness
- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Possible history of gallstones

### Pyelonephritis

- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Urinary frequency / urgency
- ◇ Dysuria
- ◇ Hematuria
- ◇ Back / Flank pain
- ◇ Costovertebral angle tenderness to percussion

## KEY DOCUMENTATION ELEMENTS

- Assessment of abdomen to include findings on palpation / percussion including presence or absence of masses and presence and nature of tenderness / pain
- Treatment and response to treatment

## PERTINENT ASSESSMENT FINDINGS

- Rebound tenderness or guarding
- Abdominal distention
- Tenderness focal to a specific abdominal quadrant
- Presence of “pulsatile” abdominal mass
- Rectal bleeding, hematemesis, vaginal bleeding

## QUALITY METRICS

- Assessment for life-threatening etiology
- Treatment of pain per the Pain Management Protocol

# Agitated or Violent Patient / Behavioral Emergencies

## History

- Situational crisis
- Psychiatric illness / medications
- Injury to self or threats to others
- Medical alert tag
- Substance abuse / overdose
- Diabetes

## Signs and Symptoms

- Anxiety, agitation, confusion
- Affect change, hallucinations
- Delusional thoughts, bizarre behavior
- Combative / Violent
- Expression of suicidal / homicidal thoughts

## Differential

- See Altered Mental Status differentials
- Alcohol intoxication
- Toxin / Substance abuse
- Medication effect / overdose
- Withdrawal syndromes
- Depression / Anxiety disorder
- Bipolar (manic-depressive)
- Schizophrenia
- Seizure / Postictal

## EMR, EMT-Basic & EMT-Intermediate

1. **UNIVERSAL PATIENT CARE.**
  - a. Maintain and support airway.
  - b. Note respiratory status—monitor pulse oximetry. Capnography should also be used if available.
  - c. Check blood glucose level.
2. Note medications / substances on scene that may contribute to the agitation or may be relevant to the treatment of a contributing medical condition.
3. If a medical or traumatic condition is suspected as the cause of the behavior, refer to the appropriate protocol.
4. Establish patient rapport
  - a. Attempt verbal reassurance and calm patient prior to use of pharmacologic and/or physical management devices.
  - b. Engage family members / loved ones to encourage patient cooperation if their presence does not exacerbate the patient's agitation.
  - c. Continued verbal reassurance and calming of patient following use of chemical / physical management devices.
5. Physical Management Devices (*See PHYSICAL RESTRAINTS Procedure*)
  - a. Patient must be out of control and a threat to themselves and/or others.
  - b. If physical restraint is required, make sure adequate personnel are present. This generally means four people, one for each of the patient's extremities.
  - c. Stretcher straps should be applied as the standard procedure for all patients during transport.
  - d. Secure all four extremities to the stationary frame of the stretcher if needed.
  - e. Physical management devices, including stretcher straps, should never restrict the patient's chest wall motion.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

Protocol Continues

# Agitated or Violent Patient / Behavioral Emergencies

## Paramedic

1. Continue **EMR / BLS / ILS TREATMENT**.
2. Sedate patient as necessary based on patient's presentation and potential for self-harm. Contact medical control prior to sedation if questions / concerns exist regarding care.
3. Administer **MIDAZOLAM** or **KETAMINE** as per the Richmond Agitation-Sedation Scale below.
  - **MIDAZOLAM**
    - **IV/IM/IN: 5 mg**; May repeat after max onset up to a maximum total dose of 10 mg.  
*Onset: IV: 3-5 min; IM: 10-15 min; IN: 3-5 min*
  - **KETAMINE\*\***
    - **IM: 4 mg/kg** *Onset: 3-5 minutes*
    - **IV: 2 mg/kg** *Onset: 1 minute*
4. If sedation is used, continuous cardiac, pulse oximetry and EtCO<sub>2</sub> monitoring and vital signs every 5 minutes are required.

\*\* If Ketamine is used, the ECIEMS office shall be notified within 24 hours for QA.

**Richmond Agitation-Sedation Scale**

<u>Score</u>	<u>Term</u>	<u>Description</u>	<u>ECIEMS Treatment</u>
+4	Combative	Overtly combative, violent, immediate danger to staff	<b>MIDAZOLAM</b> or <b>KETAMINE**</b>
+3	Very agitated	Pulls or removes tubes and catheters, aggressive	<b>MIDAZOLAM</b>
+2	Agitated	Frequent, nonpurposeful movements, fights interventions	<b>MIDAZOLAM</b>
+1	Restless	Anxious but movements are not aggressive or vigorous	Verbal reassurance and calm patient
<b>0</b>	<b>Alert and Calm</b>		
-1	Drowsy	Not fully alert but has sustained awakening and eye contact to voice (> 10 seconds)	
-2	Light Sedation	Briefly awakens with eye contact to voice (< 10 seconds)	
-3	Moderate Sedation	Movement or eye opening to voice (no eye contact)	
-4	Deep Sedation	No response to voice but movement or eye opening to physical stimulation	
-5	Unarousable	No response to voice or physical stimulation	

# Agitated or Violent Patient / Behavioral Emergencies

## Patient Safety Considerations

The management of violent patients requires a constant reevaluation of the risk / benefit balance for the patient and bystanders in order to provide the safest care for all involved. These are complex and high-risk encounters. There is no one size fits all solution for addressing these patients.

1. Don PPE.
2. Do not attempt to enter or control a scene where physical violence or weapons are present.
3. Dispatch law enforcement immediately to secure and maintain scene safety.
4. Urgent de-escalation of patient agitation is imperative in the interest of patient safety as well as for EMS personnel and others on scene.
5. Uncontrolled or poorly controlled patient agitation and physical violence can place the patient at risk for sudden cardiopulmonary arrest due to the following etiologies:
  - a. Excited delirium / exhaustive mania: A postmortem diagnosis of exclusion for sudden death thought to result from metabolic acidosis (most likely from lactate) stemming from physical agitation or physical control measures and potentially exacerbated by stimulant drugs (e.g. cocaine) or alcohol withdrawal.
  - b. Positional asphyxia: Sudden death from restriction of chest wall movement and/or obstruction of the airway secondary to restricted head or neck positioning resulting in hypercarbia and/or hypoxia.
6. Apply a cardiac monitor as soon as possible, particularly when pharmacologic management medications have been administered.
7. All patients who have received pharmacologic management medications must be monitored closely for the development of hypoventilation and oversedation.
  - a. Must utilize capnography
8. Placement of stretcher in sitting position prevents aspiration and reduces the patient's physical strength by placing the abdominal muscles in the flexed position.
9. Patients who are more physically uncooperative should be physically secured with one arm above the head and the other arm below the waist, and both lower extremities individually secured.
10. The following techniques should be expressly prohibited by EMS providers:
  - a. Secure or transport in a prone position with or without hands and feet behind the back (hobbling or "hog-tying").
  - b. "Sandwiching" patients between backboards.
  - c. Techniques that constrict the neck or compromise the airway.
  - d. EMS provider use of weapons as adjuncts in managing a patient.

# Agitated or Violent Patient / Behavioral Emergencies

## PEARLS

- Direct medical oversight should be contacted at any time for advice, especially when patient's level of agitation is such that transport may place all parties at risk.
- Stretchers with adequate foam padding, particularly around the head, facilitates patient's ability to self-position the head and neck to maintain airway patency.
- For patients with key-locking devices, applied by another agency, consider the following options:
  - a. Remove device and replace it with a device that does not require a key.
  - b. Administer pharmacologic management medication then remove and replace device with another non-key-locking device after patient has become more cooperative.
  - c. Transport patient, accompanied in patient compartment by person who has device key.

### Use SAFER model:

**S**tabilize the situation by containing and lowering the stimuli (remove unnecessary personnel, remove patient from stress, reassure, calm and establish rapport.) Keep hands in front of your body (non-threatening posture.) Only one provider should communicate with patient. Outline the patient's choices and calmly set some boundaries of acceptable behavior.

**A**ssess and acknowledge crisis by validating patient's feelings and not minimizing them.

**F**acilitate resources (Friends, family, police, chaplain).

**E**ncourage patient to use resources available and take actions in their best interest.

**R**ecovery or referral: Leave patient in care of responsible person, professional or transport to medical facility.

## KEY DOCUMENTATION ELEMENTS

- Etiology of agitated or violent behavior if known
- Patient's medications, other medications or substances found on scene
- Patient's medical history
- Physical evidence or history of trauma
- Adequate oxygenation by pulse oximetry
- Blood glucose measurement
- Measures taken to establish patient rapport
- Dose, route, number of doses and response of medications administered
- Number and physical sites of placement of restraints
- Duration of placement of restraints
- Repeated assessment of ABC's

## PERTINENT ASSESSMENT FINDINGS

- Continuous monitoring of:
  - a. Airway patency
  - b. Respiratory status with pulse oximetry and capnography
  - c. Circulatory status with frequent blood pressure measurements
  - d. Mental status and trends in level of patient cooperation
  - e. Cardiac status, especially if the patient has received pharmacologic management medication
  - f. Extremity perfusion with capillary refill in patients in physical management device

## QUALITY METRICS

- Incident of injuries to patient, EMS personnel or others on scene or during transport
- Medical or physical complications (including sudden death) in patients
- Use of Ketamine triggers Medical Director review

# Allergic Reaction / Anaphylaxis

## History

- Onset and location
- Insect sting or bite
- Food allergy / exposure
- Medication allergy / exposure
- New clothing, soap, detergent
- Past history of reactions
- Past medication history

## Signs and Symptoms

- Itching or urticaria
- Coughing, wheezing, or respiratory distress
- Chest tightness or throat constriction
- Hypotension or shock
- Persistent gastrointestinal symptoms (nausea, vomiting, and diarrhea)
- Altered mental status

## Differential

- Angioedema (drug induced)
- Aspiration / Airway obstruction
- Vasovagal event
- Asthma or COPD
- CHF

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. If signs of anaphylaxis, administer and/or assist patient with **EPINEPHRINE AUTOINJECTOR** if available.
3. If respiratory distress with wheezing is present administer **DuoNeb** nebulizer.
4. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. If signs of anaphylaxis, administer **EPINEPHRINE (1:1,000) 0.3 mg IM.**
3. May repeat **DuoNeb** nebulizer x2, if needed for continued symptomatic relief.
4. For non-anaphylactic allergic reactions, consider **DIPHENHYDRAMINE 50 mg PO.**
5. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT.**
2. If signs of anaphylaxis persist, repeat **EPINEPHRINE (1:1,000) 0.3 mg IM** every 5-15 minutes. (Max 3 doses)
3. Establish IV access.
4. Administer **NORMAL SALINE 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters.**
5. **DIPHENHYDRAMINE 50 mg IM/IV/IO/PO.** (Not to be repeated if already given by BLS provider)
6. **METHYLPREDNISOLONE 125 mg IV/IM.**
7. Closely monitor respiratory status with/IM waveform capnography and reassess need for intubation if respiratory symptoms worsen or do not improve with treatment. See AIRWAY MANAGEMENT Protocol.

# Allergic Reaction / Anaphylaxis

## PEARLS

- Allergic reactions and anaphylaxis are serious and potentially life-threatening medical emergencies.
- The shorter the onset from exposure to symptoms, the more severe the reaction.
- Localized allergic reactions (e.g. urticarial or angioedema that does not compromise the airway) may be treated with antihistamine therapy.
- Anaphylaxis should always be treated with Epinephrine as first-line treatment.
- Cardiovascular collapse may occur abruptly, without the prior development of skin or respiratory symptoms.
- Always perform cardiac monitoring when administering Epinephrine
  - Cardiac monitoring should not delay administration of Epinephrine

## Severity

- **Anaphylaxis**—More severe and characterized by an acute onset involving:
  - 1) Skin (urticaria) and/or mucosa with either respiratory compromise or hypotension (SBP < 90 mmHg) or signs of end-organ dysfunction **-OR-**
  - 2) Hypotension (SBP < 90 mmHg) for that patient after exposure to a known allergen **-OR-**
  - 3) Two or more of the following occurring rapidly after exposure to a likely allergen:
    - i. Skin and/or mucosal involvement (urticaria, itchy, swollen tongue / lips)
    - ii. Respiratory compromise (dyspnea, wheeze, stridor, hypoxemia)
    - iii. Persistent gastrointestinal symptoms (vomiting, abdominal pain, diarrhea)
    - iv. Hypotension or associated symptoms (syncope, hypotonia, incontinence)
- **Non-Anaphylactic Allergic Reaction**—Signs involving only **one** organ system (e.g. localized angioedema that does not compromise the airway or not associated with vomiting; urticaria alone).

## KEY DOCUMENTATION ELEMENTS

- Medications given
- Dose and concentration of Epinephrine given
- Route of Epinephrine administration
- Time of Epinephrine administration
- Signs and symptoms of the patient
- Waveform capnography for anaphylaxis

## PERTINENT ASSESSMENT FINDINGS

- Presence or absence of angioedema
- Presence or absence of respiratory compromise
- Presence or absence of circulatory compromise
- Localized or generalized urticaria
- Response to therapy

## QUALITY METRICS

- Percentage of patients with anaphylaxis that receive Epinephrine
- Airway assessment documented



# Altered Mental Status

## History

- History from bystanders
- Environment where patient found
- Recent complaints
- Medical alert tags. Accessory medical devices
- Diabetes
- History of trauma
- Drugs, drug paraphernalia
- Past medical history
- Medications

## Signs and Symptoms

- Decreased mental status or lethargy
- Change in baseline mental status
- Bizarre behavior
- Hypoglycemia
- Hyperglycemia
- Irritability

## Differential

- Head trauma
- CNS (stroke, tumor, seizure, infection)
- Cardiac (MI, CHF)
- Hypothermia
- Infection
- Thyroid
- Shock (septic, metabolic, traumatic)
- Diabetes (hyper / hypoglycemia)
- Toxicological or Ingestion
- Acidosis / Alkalosis
- Environmental exposure
- Pulmonary (Hypoxia)
- Electrolyte abnormality
- Psychiatric disorder

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Immobilize cervical spine if suspected spinal injury.
3. Check blood glucose level.
4. If blood glucose < 60 mg/dL (or suspected) and patient is conscious with an intact gag reflex, administer **ORAL GLUCOSE one tube (15g)**.
5. Perform F.A.S.T. Stroke Screen.
6. If opioid overdose suspected and airway compromise or inadequate respiratory effort present refer to POISONING AND OVERDOSE Protocol.
7. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If blood glucose < 60 mg/dL, administer **DEXTROSE 10% (D10) 25 g**; administer in **50 mL (5g) IV** aliquots.  
Alternative medication: **DEXTROSE 50% (D50) 25 g IV**.
4. Repeat blood glucose. Consider repeating the dose if blood glucose < 60 mg/dL, with symptoms of hypoglycemia.
5. If no IV access available, administer **GLUCAGON 1 mg IM/IN**.
6. If opioid overdose suspected and airway compromise or inadequate respiratory effort present refer to POISONING AND OVERDOSE Protocol.
7. Reassess need for intubation. Refer to the AIRWAY MANAGEMENT Protocol.

# Altered Mental Status

## PEARLS

- Altered mental status may be caused by many factors including the following: stroke, drug overdose, infection, hypoglycemia, hyperglycemia or trauma.
- Be aware of AMS as presenting sign of an environmental toxin or Haz-Mat exposure, and protect personal safety and that of other responders.
- A careful assessment of the patient, the scene and the circumstances should be undertaken.
- Pay careful attention to the head exam for signs of trauma / injury.
- DO NOT assume recreational drug use and/or alcohol are the sole reasons for Altered Mental Status.
- DO NOT assume Altered Mental Status is the result solely of an underlying psychiatric etiology.
  - Underlying medical or trauma conditions can precipitate a deterioration of a patient's underlying mental health disease.

GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Verbal	3
	To Pain	2
	None	1
Verbal Response	Oriented	5
	Confused	4
	Inappropriate Words	3
	Incomprehensible Sounds	2
	None	1
Best Motor Response	Obeys Commands	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain	3
	Extension to Pain	2
	None	1

## KEY DOCUMENTATION ELEMENTS

- GCS or AVPU description
- Pupil, neck and head exam were done
- Glucose was documented
- Temperature was taken when able
- Patient and medic safety were considered

## PERTINENT ASSESSMENT FINDINGS

- Track marks
- Breath odor
- Skin temperature
- Location

## QUALITY METRICS

- Hypoglycemia considered and treated appropriately
  - Blood glucose level obtained
- Naloxone is used as therapeutic intervention, not a diagnostic tool

# Bronchospasm / Asthma / COPD

## History

- Asthma, COPD, Chronic Bronchitis, Emphysema history
- Onset of symptoms
- Concurrent symptoms (fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, FBAO)
- Usual triggers of symptoms (cigarette smoke, change in weather, URI)
- Home treatment (oxygen, nebulizers)
- Sick contacts
- Previously intubated

## Signs and Symptoms

- Shortness of breath (inability to speak full sentences)
- Wheezing, rhonchi
- Fever, cough, congestion
- Respiratory distress (hypoxia, retractions, nasal flaring, pursed lip breathing, tripodding, cyanosis, tachypnea, etc)

## Differential

- Asthma
- Anaphylaxis
- Aspiration
- COPD
- Pleural effusion
- Pneumonia
- Pulmonary embolus
- Pneumothorax
- Cardiac (MI or CHF)
- Pericardial tamponade
- Hyperventilation
- Inhaled toxin

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. **DuoNeb** by nebulizer. May repeat x2 if needed for continued symptomatic relief.
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. **METHYLPREDNISOLONE 125 mg IV/IM.**
4. Consider CPAP application.
5. Assist ventilations with in-line nebulizer kit and BVM if necessary.
6. Reassess need for intubation if respiratory symptoms worsen or do not improve with treatment.
7. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.
2. In patients with persistent respiratory distress despite the above treatment, consider **MAGNESIUM SULFATE 2 grams IV** in 50 mL NS over 10-15 minutes
3. Continue to monitor need for intubation if respiratory symptoms worsen or do not improve with treatment. See AIRWAY MANAGEMENT Protocol.
4. If in severe distress with impending respiratory failure, consider **EPINEPHRINE (1:1,000)** at **0.3 mg IM**.

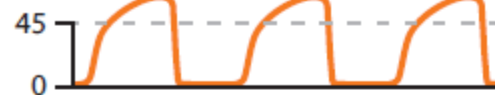
# Bronchospasm / Asthma / COPD

## PEARLS

- Pulse oximetry and end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be routinely used as an adjunct to other forms of respiratory monitoring.

### Bronchospasm (shark-fin appearance)

Asthma, COPD



- Beware of patients with a “silent chest” (absent breath sounds) as this may indicate severe bronchospasm and impending respiratory failure.
- Remember that not all wheezing is caused by asthma and that not all asthmatics wheeze.
  - Patients with congestive heart failure may present with lung sounds that mimic asthma (“cardiac wheeze”)
- Consider cardiac etiology for shortness of breath and/or chest pain and refer to CHEST PAIN protocol.
- In the asthmatic patient, pharmacologic intervention should take priority over CPAP and be given in line with CPAP.
- CPAP should not be initiated on patients with a systolic BP < 90mmHg. CPAP increases intrathoracic pressure and can decrease venous return to the heart (compromising the patient’s perfusion). Contact Medical Control and use CPAP cautiously if the systolic BP is between 90-100 mmHg for the same reason.
- Giving positive pressure in the setting of bronchoconstriction, either via a Blind Insertion Airway Device (BIAD) or intubation, increases the risk of air trapping which can lead to pneumothorax and cardiovascular collapse. These interventions should be reserved for situations of respiratory failure.

## KEY DOCUMENTATION ELEMENTS

- Respiratory rate
- Oxygen saturation and EtCO<sub>2</sub>
- Use of accessory muscles
- Breath sounds
- Air entry
- Mental status
- Color
- Response to interventions

## PERTINENT ASSESSMENT FINDINGS

- In the setting of severe bronchoconstriction, wheezing might not be heard. Patients with known asthma who complain of chest pain or shortness of breath should be empirically treated, even if wheezing is absent.

## QUALITY METRICS

- CPAP utilization
- Utilization of continuous pulse oximetry and EtCO<sub>2</sub>

# Diabetic Emergencies

## History

- Past medical history
- Medications (insulin, etc.)
- Recent blood glucose check
- Last meal

## Signs and Symptoms

- Altered mental status
- Combative / Irritable
- Seizures
- Nausea / Vomiting
- Dehydration
- Diaphoresis
- Weakness
- Signs of DKA (abdominal pain, fruity breath, Kussmaul respirations)

## Differential

- Alcohol / Drug use
- Toxic ingestion
- Trauma; head injury
- Seizure
- Stroke
- Altered mental status
- Diabetic Ketoacidosis

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Check a blood glucose level.
3. If blood glucose < 60 mg/dL (or suspected) **and** patient is conscious with an intact gag reflex, administer **ORAL GLUCOSE one tube (15g) PO.**
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access.
3. If blood glucose < 60 mg/dL, administer **DEXTROSE 10% (D10) 25 g**; administer in **50 mL (5g) IV aliquots.**  
Alternative medication: **DEXTROSE 50% (D50) 25 g IV.**
4. Repeat blood glucose. Consider repeating the dose if blood glucose < 60 mg/dL, with symptoms of hypoglycemia.
5. If no IV access available, administer **GLUCAGON 1 mg IM/IN.** May repeat in 5 minutes if no change in LOC.
6. If blood glucose > 300 mg/dL, administer **NORMAL SALINE 20 mL/kg** fluid bolus. Reassess and re-bolus as needed as lungs remain clear.

## Hypoglycemia Refusal Criteria

**\*\*Must contact Medical Control\*\***

- Repeat glucose is greater than 80 mg/dL.
- Patient is a known diabetic.
- Patient returns to normal mental status, with no focal neurologic signs / symptoms after receiving glucose / dextrose.
- Patient can promptly obtain and will eat a carbohydrate meal.
- Patient or legal guardian refuses transport and EMS providers agree transport not indicated.
- A reliable adult will be staying with patient.
- No major co-morbid symptoms exist, like chest pain, shortness of breath, seizures, intoxication.
- A clear cause of the hypoglycemia is identified (e.g. missed meal).

# Diabetic Emergencies

## PEARLS

### Hypoglycemia

- Dextrose 10% is the preferred formulation for administration for hypoglycemia.
  - There are no statistically significant differences in the median recovery time following administration of D10% versus D50%.
- Dextrose 50% can cause local tissue damage if it extravasates from vein, and may cause overshoot hyperglycemia.
- Patients taking oral diabetic medications (particularly Sulfonylureas, i.e. glyburide, glipizide) and/or long acting insulin, should be encouraged to allow transportation to a medical facility as they are at risk of recurrent hypoglycemia that can be delayed for hours and require close monitoring even after normal blood glucose is established.
- Patients who meet criteria to refuse care after a hypoglycemic event should be instructed to contact their physician and consume a meal.
- If possible, have family / patient turn off insulin pumps.
- Consider potential for intentional overdose of hypoglycemic agents.

### Hyperglycemia

- Consider causes for hyperglycemia by thinking about the 3 I's:
  - a. Insulin – this refers to any medication changes for insulin or oral medications including poor compliance or malfunctioning insulin pump.
  - b. Ischemia – this refers to hyperglycemia sometimes being an indication of physiologic stress in a patient and can be a clue to myocardial ischemia in particular.
  - c. Infection – underlying infection can cause derangements in glucose control
- Diabetic ketoacidosis (DKA) is a life-threatening emergency defined as uncontrolled hyperglycemia and the signs and symptoms of ketoacidosis.

Signs and symptoms of DKA include uncontrolled blood glucose usually greater than 250 mg/dL, weakness, altered mental status, abdominal pain, nausea, vomiting, polyuria (excessive urination), polydipsia (excessive thirst), fruity odor on the breath (from ketones), or tachypnea (Kussmaul respirations—low EtCO<sub>2</sub>).
- Hyperglycemic Hyperosmolar Nonketotic State (HHNS) is characterized by blood glucose levels usually greater than 600 mg/dL and profound dehydration with significant neurologic deficits (e.g. coma, AMS).

## KEY DOCUMENTATION ELEMENTS

- Document glucose level
- Document reassessment of vital signs and mental status after treatment
- Document patient capacity and contacting Medical Control for all diabetic refusals

## PERTINENT ASSESSMENT FINDINGS

- Concomitant trauma
- Diaphoresis or hypothermia may be associated with hypoglycemia
- Abdominal pain, “fruity breath,” and Kussmaul breathing may be associated with DKA

## QUALITY METRICS

- Glucose level checked when appropriate.
- If patient released at scene, criteria documented for safe release.
- Hyper- / Hypoglycemia considered and treated appropriately

# Foreign Body Airway Obstruction

## History

- Time of onset of symptoms
- Associated symptoms
- Choking or other evidence of upper airway obstruction
- History of trauma

## Signs and Symptoms

Sudden onset of respiratory distress:

- Coughing
- Wheezing
- Gagging
- Stridor
- Shortness of breath
- Abnormal color (cyanosis or pallor)

## Differential

- Cardiac arrest
- Respiratory arrest
- Anaphylaxis
- Esophageal obstruction

## All Levels

### Conscious Patient – Able To Speak:

1. **UNIVERSAL PATIENT CARE.**
2. Leave patient alone; offer reassurance.
3. Encourage coughing.

### Conscious Patient – Unable To Speak:

1. Administer abdominal thrusts / Heimlich maneuver until the foreign body is expelled or until the patient becomes unconscious.
2. After the obstruction is relieved, reassess the airway, lung sounds, skin color and vital signs.
3. **UNIVERSAL PATIENT CARE.**

### Unconscious Patient:

1. Place patient in a supine position and begin chest compressions.
2. Open the airway and check for Foreign Body Airway Obstruction. If object is visible, perform finger sweep to remove.
3. If object is not visible, continue chest compressions until object dislodged.

## EMT-Intermediate

### Unconscious Patient:

1. Continue above treatment.
2. Perform advanced airway control measures as available, using the AIRWAY MANAGEMENT Protocol. Utilize Magill forceps as necessary.

## Paramedic

### Unconscious Patient:

1. Continue above treatment.
2. If unable to clear obstruction, consider surgical airway placement, as outlined in the AIRWAY MANAGEMENT Protocol.

# Foreign Body Airway Obstruction

## PEARLS

- If air exchange is adequate with a partial airway obstruction, do not interfere; instead, encourage the patient to cough up the obstruction. Continue to monitor the patient for adequacy of air exchange. If air exchange becomes inadequate, continue with the protocol.
- Do not perform blind finger sweeps in the mouth and posterior pharynx. This may push the object farther into the airway.

## KEY DOCUMENTATION ELEMENTS

- Initial vital signs and physical exam
- Interventions attempted and the number of attempts to achieve a successful result
- Subsequent vital signs and physical exam to assess for change after interventions

## PERTINENT ASSESSMENT FINDINGS

- Acute worsening of respiratory status or evidence of hypoxemia

## QUALITY METRICS



# Nausea / Vomiting

## History

- Appearance of emesis (bloody, etc)
- Time of last meal
- Last bowel movement / emesis
- Improvement or worsening with food or activity
- Duration of symptoms
- Sick contacts
- Past medical history
- Past surgical history
- Medications
- Last Menstrual Period / Pregnancy
- Travel history
- Suspected food poisoning

## Signs and Symptoms

- Fever
- Pain
- Constipation
- Diarrhea
- Anorexia
- Hematemesis

## Differential

- CNS (increased pressure, headache, stroke, CNS lesions, trauma or hemorrhage, vestibular)
- Myocardial infarction
- Drugs (NSAID's, antibiotics, narcotics, chemotherapy)
- GI or Renal disorders
- Diabetic Ketoacidosis (DKA)
- Gynecologic disease (ovarian cyst, PID)
- Infections
- Electrolyte abnormalities
- Food or toxin induced
- Substance abuse
- Pregnancy
- Psychological

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. Consider trial of inhalation from an isopropyl alcohol prep pad.
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. Administer **ONDANSETRON ODT 4mg PO.**
  - a. Contraindicated for suspected or known diagnosis of prolonged QT syndrome.
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access.
3. Consider **NORMAL SALINE 500 mL bolus** for signs of dehydration. Repeat fluid bolus as needed; maximum **2 liters.**
4. Administer **ONDANSETRON 4 mg IV or IM** or **ONDANSETRON ODT 4mg PO.** May repeat 4mg dose x1 after 15 minutes (max total dose 8mg).
  - a. Contraindicated for suspected or known diagnosis of prolonged QT syndrome.

# Nausea / Vomiting

## PEARLS

- Nausea and vomiting are symptoms of illness – in addition to treating the patient's nausea and vomiting a thorough history and physical are key to identifying what may be a disease in need of emergent treatment (e.g. bowel obstruction, myocardial infarction, pregnancy).
- Nausea / vomiting is a common finding associated with acute coronary syndrome. Consider obtaining a 12-lead ECG when appropriate.
- While ondansetron has not been adequately studied in pregnancy to determine safety, it remains a treatment option for hyperemesis gravidum in pregnant patient.
- Inhaled isopropyl alcohol has shown promise as an antiemetic and may be superior to oral ondansetron. The mechanism of isopropyl alcohol's antiemetic effect remains unclear.

April MD, Oliver JJ, Davis WT, et al. Aromatherapy versus oral ondansetron for antiemetic therapy among adult emergency department patients: a randomized controlled trial. *Ann Emerg Med*, 2018 Aug; 72(2): 184-93.

## KEY DOCUMENTATION ELEMENTS

- Patient age
- Medications given, including time, provider level, dose, dose units, route, response and complications
- Vital signs before and after medication administration
- History and physical with regard to etiology of nausea/vomiting
- ECG performed and interpretation documented if cardiac risk factors are present

## PERTINENT ASSESSMENT FINDINGS

- Vital signs
- Risk factors for heart disease / ECG if applicable
- Pregnancy status
- Abdominal exam

## QUALITY METRICS

- In patients with nausea and vomiting, appropriate medication(s) was / were administered (including proper dosage) and the patient's response to treatment is documented

# Respiratory Distress with a Tracheostomy Tube / Ventilator

## History

- Birth defect (tracheal atresia, tracheomalacia, craniofacial abnormalities)
- Past medical history (bronchopulmonary dysplasia, muscular dystrophy, post-traumatic brain or spinal cord injury, etc. )
- History of tracheostomy
- Possibility of foreign body
- Concurrent symptoms (fever, cough, rhinorrhea, rash, labored breathing)
- Usual triggers of symptoms (cigarette smoke, change in weather, URI)
- Sick contacts

## Signs and Symptoms

- Power or equipment failure at residence
- Wheezing, rhonchi, stridor
- Respiratory distress (hypoxia, retractions, nasal flaring, tripodding, cyanosis, tachypnea, etc)
- Shortness of breath (inability to speak full sentences)
- Copious secretions coming from tracheostomy tube
- Anxious appearing
- Fever, cough, congestion
- Tachycardia

## Differential

- Disruption of oxygen source
- Dislodged or obstructed tracheostomy tube
- Detached or disrupted ventilator circuit
- Ventilator failure
- Asthma / Reactive Airway Disease
- Allergic Reaction / Anaphylaxis
- Aspiration
- Foreign body
- Pneumonia
- Congenital heart disease
- Medication or toxin
- Trauma

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Place patient in position of comfort.
3. Administer 100% **OXYGEN** per **tracheostomy collar**.
4. If tracheostomy tube is obstructed with secretions, suction tracheostomy tube.
  - a. Remove inner catheter of tracheostomy tube and re-suction.
  - b. Suction for no more than 10-15 seconds while withdrawing the suction catheter.
  - c. 2-3 mL saline may be used to help loosen secretions.
5. If tracheostomy tube still remains obstructed have caregiver / family assist in changing tracheostomy tube if there is a spare tube available.
6. If tracheostomy tube still remains obstructed, ventilate with 100% **OXYGEN** via **Bag Valve Mask (BVM)**.
7. Consider **DuoNeb** by nebulizer. May repeat x2 if needed for continued symptomatic relief.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Reassess patency of tracheostomy tube. If needed, replace tracheostomy tube with spare tracheostomy tube or appropriately sized ET tube into stoma.

# Respiratory Distress with a Tracheostomy Tube / Ventilator

## PEARLS

- Pulse oximetry and end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be routinely used as an adjunct to other forms of respiratory monitoring.
- Always talk to family / caregivers as they have specific knowledge and skills.
- Use patients equipment if available and functioning properly.
- Estimate suction catheter size by doubling the inner tracheostomy tube diameter and rounding down.
- Suction depth: ask family / caregiver. No more than 3 to 6 cm typically.
- Do NOT force suction catheter. If unable to pass, then tracheostomy tube should be changed.
- Always deflate tracheal tube cuff before removal.
- ETT size should be same as tracheostomy tube size. Also have a 0.5 size smaller available.
- **DOPE:** Displaced tracheostomy tube / ETT, **O**bstructed tracheostomy tube / ETT, **P**neumothorax and **E**quipment Failure.

## KEY DOCUMENTATION ELEMENTS

- Respiratory assessment
- Tracheostomy tube assessment (obstruction, etc)
- Tracheostomy tube size
- Documentation of replacement trach / ETT size

## PERTINENT ASSESSMENT FINDINGS

- Tracheostomy tube assessment
- **DOPE**

## QUALITY METRICS

- Utilization of continuous pulse oximetry and EtCO<sub>2</sub>

# Seizure / Status Epilepticus

## History

- Reported / witnessed seizure activity
- Previous seizure history
- Medical alert tag history
- Seizure medications (recent changes, compliance)
- Medications administered prior to arrival
- History of trauma
- History of diabetes
- History of pregnancy
- Time of seizure onset
- Number of seizures
- Alcohol use, abuse or abrupt cessation
- Fever

## Signs and Symptoms

- Decreased mental status
- Sleepiness
- Incontinence
- Observed seizure activity
- Evidence of trauma
- Unconscious

## Differential

- CNS (head) trauma
- Tumor
- Metabolic, Hepatic, or Renal failure
- Hypoxia
- Electrolyte abnormality
- Drugs, Medications, Non-compliance
- Infection / Fever
- Alcohol withdrawal
- Eclampsia
- Stroke
- Hyperthermia
- Hypoglycemia

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level.
2. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
3. Immobilize cervical spine if indicated.
4. Position patient to prevent injury.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If seizure persists longer than three minutes, administer **MIDAZOLAM**:  
**IN/IM: 0.2 mg/kg IM** (maximum dose 10 mg) (10mg/2ml concentration)  
- OR -  
**IV/IO: 0.1 mg/kg IV** over 2 minutes (maximum dose 5 mg); may repeat x 1 after 5 minutes if seizure persists.
4. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
5. For any seizure in a pregnant patient, refer to the ECLAMPSIA/PRE-ECLAMPSIA Protocol.



**Medical Control**



6. If seizure persists, contact Medical Control for additional **MIDAZOLAM**.

# Seizure / Status Epilepticus

## PEARLS

- **Status Epilepticus** is defined as two or more successive seizures without a period of consciousness or recovery. This is a true emergency requiring rapid airway control, treatment, and transport.
- **Grand Mal Seizures (generalized)** are associated with loss of consciousness, incontinence, and tongue trauma.
- **Focal Seizures** affect only a part of the body and are not usually associated with a loss of consciousness, but can propagate to generalized seizures with loss of consciousness.
- Benzodiazepines are effective in terminating seizures; **do not delay IM/IN administration while initiating an IV.**
- Many airway / breathing issues in seizing patients can be managed without intubation or placement of an advanced airway. Reserve these measures for patients that fail less invasive maneuvers as noted above.
- For new onset seizures or seizures that are refractory to treatment, consider other potential causes including, but not limited to, trauma, stroke, electrolyte abnormality, toxic ingestion, pregnancy with eclampsia, hyperthermia.
- For any seizure in a pregnant patient, follow the OBSTRETRIC AND GYNECOLOGICAL CONDITIONS

## KEY DOCUMENTATION ELEMENTS

- Actively seizing during transport and time of seizure onset / cessation
- Concurrent symptoms of apnea, cyanosis, vomiting, bowel/bladder incontinence or fever
- Medication amounts/routes given by bystanders or prehospital providers
- Neurologic status (GCS, nystagmus, pupil size, focal neurologic deficit or signs of stroke)
- Blood glucose level

## PERTINENT ASSESSMENT FINDINGS

- Acute worsening of respiratory status or evidence of hypoxemia
- Neurologic status
- Blood glucose level
- Be alert for concurrent traumatic injuries in seizure patients

## QUALITY METRICS

- Time to administration of anticonvulsant medication
- Blood glucose level obtained

# Sepsis

## History

- Duration and severity of fever
- Altered mental status
- Past medical history
- Medications / Recent antibiotics
- Immunocompromised (Transplant, HIV, Diabetes, Cancer)
- Recent hospitalization / Healthcare facility
- Prosthetic device / Indwelling device
- Last antipyretic (acetaminophen, ibuprofen)

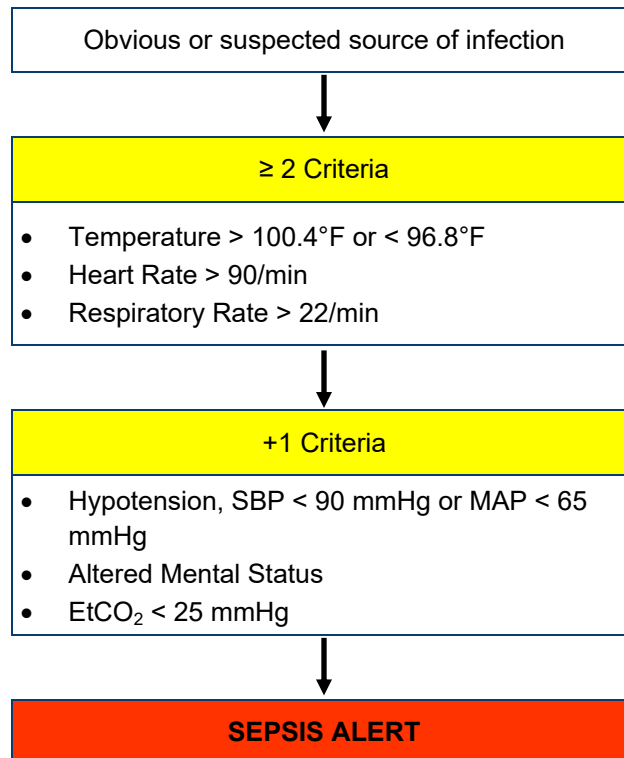
## Signs and Symptoms

- Hyperthermia > 100.4°F (38°C)
- Hypothermia < 96.8°F (36°C)
- Tachycardia (HR > 90)
- Tachypnea (RR > 22)
- Hypotension (SBP < 100)
- Altered mental status
- Hyperglycemia / Hypoglycemia

## Differential

- Infections (UTI, pneumonia, skin/soft tissue, etc)
- Cancer / Tumors / Lymphomas
- Medication or drug reaction
- Hyperthyroidism
- Heat Stroke
- Meningitis
- Hypoglycemia / Hypothermia
- MI
- Stroke
- Pulmonary embolism

## Criteria



Protocol Continues

# Sepsis

## EMR

1. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level. If blood glucose < 60 mg/dL refer to DIABETIC EMERGENCIES protocol for treatment.
2. Reassess patient and vital signs every 5 minutes.
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. If temperature is greater than 100.4°F, administer **ACETAMINOPHEN 1000 mg PO.**
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT.**
2. Notify receiving hospital of “**SEPSIS ALERT**”.
3. Consider 12-Lead ECG.
4. Establish at least one large bore IV.
  - a. Administer **NORMAL SALINE 30 mL/kg** (Ideal Body Weight) fluid bolus (**Document TOTAL amount of IVF given**).
    - i. Reassess after each 250 mL increment and STOP fluids if signs of pulmonary edema (increasing shortness of breath or rales / crackles on lung exam).
    - ii. May repeat to maintain SBP ≥ 90 mmHg or MAP ≥ 65 mmHg as long as pulmonary edema is not suspected.
    - iii. Total amount of IVF should not exceed 2000 mL
5. Continue to reassess patient including vital signs (manual BP), breath sounds, capnography, pulse oximetry, cardiac monitor.

## Paramedic

1. Continue **ILS TREATMENT.**
2. For hypotension not responsive to 2,000 mL fluid bolus, consider **NOREPINEPHRINE (Levophed) 2-30 mcg/min** (if available, with IV pump) titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

Alternative medication: **DOPAMINE** at **5mcg/kg/min** titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

\*\*\*While drip is being set up, consider **PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO** every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP > 65 mmHg.

  - a. Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/mL.



# Sepsis

## PEARLS

- **Sepsis** is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection.
  - In lay terms, sepsis is a life-threatening condition that arises when the body's response to an infection injures its own tissues and organs.
- **Septic Shock** is a subset of sepsis in which underlying circulatory and cellular / metabolic abnormalities resulting in hypotension that require vasopressors to maintain a MAP of  $\geq 65$  mmHg and having a serum lactate level of  $\geq 2$  mmol/L despite adequate volume resuscitation, resulting in a higher risk of mortality.
- Early recognition of Sepsis allows for attentive care and early administration of antibiotics.
- Quantitative waveform capnography can be a reliable surrogate for lactate monitoring in detecting metabolic distress in sepsis patients.  $\text{EtCO}_2 < 25$  mm Hg are associated with serum lactate levels  $> 4$  mmol/L.
- Aggressive IV fluid therapy is the most important prehospital treatment for sepsis. Suspected septic patients should receive repeated fluid boluses while being checked frequently for signs of pulmonary edema, especially patients with known history of CHF or ESRD on dialysis. STOP fluid infusion in the setting of pulmonary edema.
- ECG should be obtained with suspected sepsis, but should not delay care in order to obtain.

Ideal Body Weight (kg)						
Height	Male	Female		Height	Male	Female
5'	50	46		5'9"	71	66
5'1"	52	49		5'10"	73	69
5'2"	55	50		5'11"	75	71
5'3"	57	52		6'	78	73
5'4"	59	55		6'1"	80	75
5'5"	62	57		6'2"	82	78
5'6"	64	59		6'3"	85	80
5'7"	66	62		6'4"	87	82
5'8"	68	64		6'5"	89	85

## KEY DOCUMENTATION ELEMENTS

- Sepsis criteria that patient met
- Full vital signs with reassessment every 15 minutes
- Neurologic status assessment
- Amount of IV fluid given

## PERTINENT ASSESSMENT FINDINGS

- Full vital signs
- Criteria for Sepsis
- Findings of hypoperfusion: AMS, hypotension,  $\text{EtCO}_2 < 25$  mmHg

## QUALITY METRICS

- Advance hospital notification for suspected sepsis patients
- Administration of IV fluid to suspected sepsis patients unless contraindicated

# Sepsis

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# Shock

## History

- Blood loss (GI, vaginal, AAA, etc.)
- Fluid loss (vomiting, diarrhea, fever)
- Infection
- Cardiac problems (MI, CHF)
- Medications
- Allergic reaction

## Signs and Symptoms

- Altered mental status
- Syncope
- Tachycardia
- Diaphoresis
- Hypotension (SBP < 90 mmHg or MAP < 65 mmHg)
- Pale, cool, clammy skin
- Delayed capillary refill (> 2 sec)

## Differential

- Infection / Sepsis
- Dehydration (Vomiting, Diarrhea)
- Medication / Overdose
- Vasovagal
- Physiologic (pregnancy)
- Pulmonary embolus
- Tension pneumothorax
- Trauma

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Keep patient warm and elevate feet.
3. Control bleeding as necessary. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Consider **NORMAL SALINE 20 mL/kg** fluid bolus to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. May repeat fluid bolus x2 as needed to maintain SBP  $\geq$  90 mmHg as long as lungs remain clear.
  - a. If signs of cardiogenic shock, limit fluid boluses and refer to CHF / PULMONARY EDEMA Protocol.
4. If tension pneumothorax suspected, perform NEEDLE DECOMPRESSION.
5. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.
2. For hypotension not responsive to fluid boluses, consider **NOREPINEPHRINE (Levophed) 2-30 mcg/min** (if available, with IV pump) titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

Alternative medication: **DOPAMINE** at **5mcg/kg/min** titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

\*\*\*While drip is being set up, consider **PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO** every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP > 65 mmHg.

  - a. Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/mL.

# Shock

## PEARLS

- Early, aggressive IV fluid administration is essential in the treatment of suspected shock.
- Patients predisposed to shock:
  - a. Immunocompromised (patients undergoing chemotherapy or with a primary or acquired immunodeficiency)
  - b. Adrenal insufficiency (Addison's disease, congenital adrenal hyperplasia, chronic or recent steroid use)
  - c. History of a solid organ or bone marrow transplant
  - d. Infants
  - e. Elderly
- In most adults, tachycardia is the first sign of compensated shock, and may persist for hours. Tachycardia can be a late sign of shock in children and a tachycardic child may be close to cardiovascular collapse.
- Hypotension indicates uncompensated shock, which may progress to cardiopulmonary failure within minutes

**Hypovolemic Shock:** Hemorrhage, Trauma, GI bleeding, Ruptured aortic aneurysm or Pregnancy related bleeding.

- Signs / Symptoms: Tachycardia, Weak thready pulse, Hypotension, Diaphoresis, Cool Skin, Pallor, Flat Neck Veins

**Cardiogenic Shock:** Heart failure, MI, Cardiomyopathy, Myocardial contusion, Ruptured ventricular / septum / valve, toxins.

- Signs / Symptoms: Chest pain, Shortness of breath, Rales, JVD, Hypotension, Tachycardia, Diaphoresis

**Distributive Shock:** Sepsis, Anaphylactic, Neurogenic (hallmark is warm, dry, pink skin with normal capillary refill time and typically alert), Toxins.

- Signs / Symptoms Neurogenic Shock: Sensory and/or motor loss, Hypotension, Bradycardia vs Normal heart rate, Warm, dry skin

**Obstructive Shock:** Pericardial tamponade, Pulmonary embolus, Tension pneumothorax. Signs may include hypotension with distended neck veins, tachycardia, unilateral decreased breath sounds or muffled heart sounds.

- Signs / Symptoms Tension Pneumothorax: Asymmetric or absent breath sounds, Respiratory distress or hypoxia, signs of shock including tachycardia and hypotension, JVD, tracheal deviation (late sign)

**Acute Adrenal Insufficiency:** State where body cannot produce enough steroids (glucocorticoids / mineralocorticoids). May have primary or secondary adrenal disease or more commonly have stopped a steroid like prednisone.

## KEY DOCUMENTATION ELEMENTS

- Full vital signs with reassessment every 15 minutes
- Neurologic status assessment
- Amount of IV fluid given
- Medications given

## PERTINENT ASSESSMENT FINDINGS

- Full vital signs
- Decreased perfusion manifested by altered mental status, or abnormalities in capillary refill or pulses.

## QUALITY METRICS

- Percentage of patients who receive pressors for ongoing hypotension after receiving appropriate IV fluid

# Stroke

## History

- Previous stroke / TIA's
- "Last Known Well" Time
- Previous cardiac / vascular surgery
- Associated diseases: diabetes, hypertension CAD
- Atrial fibrillation
- Medications (blood thinners)
- History of trauma
- Sickle Cell Disease
- Seizure activity

## Signs and Symptoms

- Altered mental status
- Neuro deficit (facial droop, localized weakness, gait disturbance, slurred speech)
- Hemiparesis or hemiplegia
- Dysconjugate gaze, force or crossed gaze
- Blindness or other sensory loss
- Vertigo / Dizziness
- Syncope
- Headache
- Seizures
- Respiratory pattern change
- Hypertension / Hypotension
- Vomiting

## Differential

- TIA
- Seizure
- Hypoglycemia
- Sepsis
- Migraine
- Tumor
- Trauma
- Intoxication

\*\*see AMS differentials

## Stroke Alert Criteria

- Time last known well < 24 hours or unknown
- Blood glucose is or has been corrected to > 60 mg/dL
- Positive Prehospital Stroke Scale

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Perform prehospital stroke scale (BE FAST).
3. Check blood glucose level.
4. If blood glucose < 60 mg/dL, refer to the DIABETIC EMERGENCIES Protocol.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Repeat prehospital stroke scale (BE FAST) with LVO screening tool (VAN).
3. Establish IV access.
4. Continuous monitoring of patient with cardiac monitor, continuous SpO2 and capnography.
  - a. Consider 12-lead ECG
5. Notify receiving facility of "Stroke Alert" as soon as possible and/or possibility of LVO if applicable.

"BE FAST was developed by Intermountain Healthcare, as an adaptation of the FAST model implemented by the American Stroke Association. Reproduced with permission from Intermountain Healthcare. © 2011 Intermountain Healthcare. All rights reserved."

# Stroke

## Prehospital Stroke Scale

\*\*\*If any of the below are abnormal, it is considered a positive stroke scale.\*\*\*

### Balance

Loss of Balance: Sudden loss of balance or coordination

- **Normal:** Can walk unassisted and upright. No change in ability to walk
- **Abnormal:** Sudden loss of balance, staggering gait, severe vertigo

### Eyes

Loss of Vision: Sudden loss of vision in one or both eyes or onset of double vision

- **Normal:** No sudden vision changes
- **Abnormal:** Sudden vision change or loss in one or both eyes

### Face

Facial Droop: Have patient smile or show teeth

- **Normal:** Both sides of face move equally
- **Abnormal:** One side of face does not move as well as the other side

### Arm

Motor Weakness: Arm drift (close eyes, extend arms, palms up)

- **Normal:** Both arms move the same or both arms do not move at all
- **Abnormal:** One arm drifts down compared with the other or does not move

### Speech

Abnormal Speech: Have the patient say "you can't teach an old dog new tricks".

- **Normal:** Patient uses correct words with no slurring
- **Abnormal:** Patient slurs words, uses the wrong words, or is unable to speak

### Time

Time of Onset: When was the person last known well?

- Time last seen normal: \_\_\_\_\_
- Time of symptom onset: \_\_\_\_\_

If patient has **ARM WEAKNESS** present, continue on to VAN screening tool



## VAN Screening Tool

\*\*\*Patient must have weakness plus one or all of the V, A, or N to be VAN positive.\*\*\*

### Vision

Vision Loss (*display 2 fingers left, 1 finger right*) (usually same side as weakness)

Right    Left

Gaze (*usually away from side of weakness*)

Right    Left

### Aphasia

*\*\*Usually goes with right sided weakness*

Expressive (inability to speak or naming difficulties) **Do not count slurring of words**  
(*repeat "today is a sunny day" and name 2 objects*)

Receptive (not understanding or can't follow commands) (*close eyes, make a fist*)

### Neglect

*\*\*Usually goes with left sided weakness*

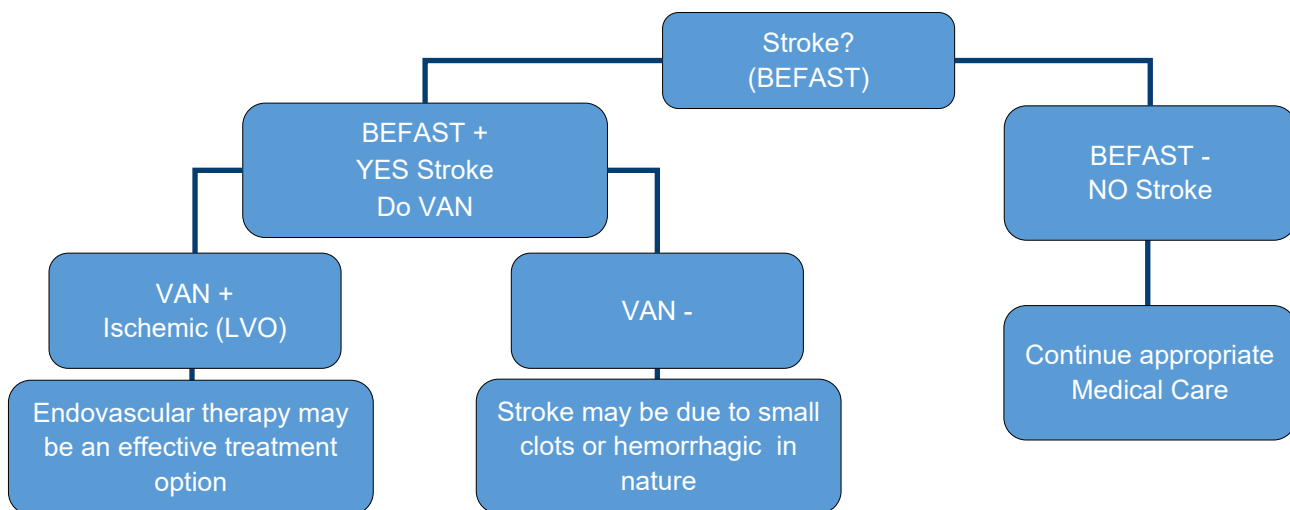
Patient ignores left side when both sides are touched simultaneously

(*With eyes closed, ask patient to say "left, right or both" when arms are touched*)

# Stroke

## PEARLS

- “Last Known Well” Time or Last Seen Normal is one of the most important items that EMS can obtain, of which all treatment decisions are based.
  - a. Defined as the last witnessed time the patient was symptom free (i.e. awakening with stroke symptoms would be defined as an onset time of the previous night when patient was symptom free or last awake)
- Prevent aspiration – elevate head of stretcher 15-30 degrees if systolic BP greater than 100 mm Hg.
  - a. Maintain head and neck in neutral alignment, without flexing the neck
- Protect paralyzed limbs from injury.
- Be alert for airway problems (swallowing difficulty, vomiting/aspiration).
- Hypoglycemia can present as a localized neurologic deficit.
- Document the Stroke Screen results in the report.
- Consider 12-Lead ECG on suspected stroke patients.



## KEY DOCUMENTATION ELEMENTS

- “Last Known Well” Time or Last Seen Normal
- Blood glucose level
- Stroke screen used and findings
- Time of notification to receiving hospital

## PERTINENT ASSESSMENT FINDINGS

- Prehospital Stroke Scale
- LVO Screening Tool

## QUALITY METRICS

- Suspected stroke patient receiving prehospital screening
- Documentation of “Last Known Well” Time
- Glucose testing for suspected stroke patients
- Advance hospital notification for suspected stroke patients
- Scene time for suspected stroke patients

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# Bradycardia

## History

- Past medical history
- Medications (Beta-Blockers, Calcium Channel Blockers, Clonidine, Digoxin)
- Pacemaker

## Signs and Symptoms

- **HR < 60/min** with:
  - Chest pain
  - Respiratory distress
  - Hypotension or Shock
  - Altered mental status
  - Syncope

## Differential

- Acute Myocardial Infarction (MI)
- Hypoxia / Hypothermia
- Pacemaker failure
- Sinus bradycardia
- Athletic
- Head injury (elevated ICP) / Trauma
- Stroke
- Spinal cord lesion
- Sick Sinus Syndrome
- AV blocks (1°, 2° or 3°)
- Overdose

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Consider possible underlying causes of bradycardia (*see differentials above*).
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT.**
  - a. Obtain 12-lead ECG within 10 minutes, if not already obtained, and transmit to receiving facility.
2. Establish IV access.

### **STABLE** Asymptomatic

1. Continue supportive care and monitor for signs and symptoms of symptomatic/unstable bradycardia.

### **UNSTABLE** Symptomatic (*Hypotension, Chest Pain, AMS, acute CHF, syncope, or other signs of hypoperfusion/shock*)

1. Prepare for TRANSCUTANEOUS PACING for unstable patients with signs of hypoperfusion.
2. Consider **ATROPINE 1 mg IV/IO every 3-5 minutes** to a total dose of **3mg**, as long as symptomatic bradycardia persists.
  - a. Atropine is **NOT** effective for Mobitz Type II Second-Degree or Third-Degree AV blocks as well as transplanted and total artificial hearts and providers should proceed to transcutaneous pacing.
3. Initiate TRANSCUTANEOUS PACING if patient remains symptomatic.
  - a. Consider sedation with **MIDAZOLAM 2 mg IV/IO** as able; repeat in 5 minutes as needed to maintain sedation throughout procedure.
  - b. Providers **SHOULD NOT** delay pacing in order to administer Atropine, especially in patients with poor perfusion in the setting of **STEMI, Mobitz Type II Second-Degree or Third-Degree AV blocks.**

Protocol Continues

# Bradycardia

## Paramedic

1. Continue **ILS TREATMENT**.
2. If persistent bradycardia or hypotension, consider **DOPAMINE** at **5mcg/kg/min** titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg or **PUSH DOSE EPINEPHRINE**.
  - \*\*\***PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO** every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP > 65 mmHg.
    - a. Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/mL.

Alternative medication: **NOREPINEPHRINE (Levophed) 2-30 mcg/min** (if available, with IV pump) titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg

Protocol Continues 

# Bradycardia

## PEARLS

- Bradycardia should be managed via the least invasive manner possible. However, in cases of impending hemodynamic collapse, providers should proceed directly to transcutaneous pacing.
- Do not delay transcutaneous pacing in order to administer atropine.
- Mobitz Type II Second-Degree and Third-Degree AV blocks as well as the denervated heart (as in cardiac transplant) likely will not respond to atropine and in these cases, proceed to transcutaneous pacing and/or chronotropic agents (such as epinephrine or dopamine).
- Although dopamine is often recommended for the treatment of symptomatic bradycardia, recent research suggests that patients in cardiogenic or septic shock treated with norepinephrine have a lower mortality rate compared to those treated with dopamine
- The major ECG rhythms classified as bradycardia include:
  - a. Sinus bradycardia
  - b. Second-degree AV block
    - i. Type I - Wenckebach / Mobitz I
    - ii. Type II - Mobitz II
  - c. Third-degree AV block (Complete Heart Block)
  - d. Ventricular escape rhythms (Idioventricular Rhythms)
- Observe for signs of decreased end-organ perfusion: chest pain (CP), shortness of breath (SOB), decreased level of consciousness, syncope or other signs of shock/hypotension.
- Patients who have undergone cardiac transplant will not respond to Atropine.
- Consider potential culprit medications including beta-blockers, calcium channel blockers, sodium channel blockers / anti-depressants, digoxin, and clonidine.
- Consider hyperkalemia in the patient with wide complex bradycardia.
- Hypoxemia is a common cause of bradycardia; be sure to oxygenate the patient.
- Be aware of acute coronary syndrome as a cause of bradycardia in adult patients.

## KEY DOCUMENTATION ELEMENTS

- Cardiac rhythm / rate
- Time, dose and response of medications given
- Pacing: Time started or stopped, rate, joules, capture and response
- History of event supporting treatment of underlying causes

## PERTINENT ASSESSMENT FINDINGS

- 12-Lead ECG

## QUALITY METRICS

- Correct medication and dose given for patient condition
- Correct application and use of cardiac pacing
- Use of sedation with cardiac pacing

# Bradycardia

## Rhythms

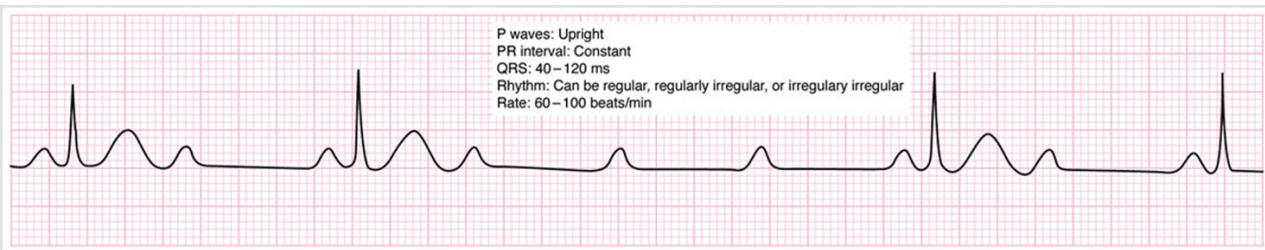
- Sinus Bradycardia



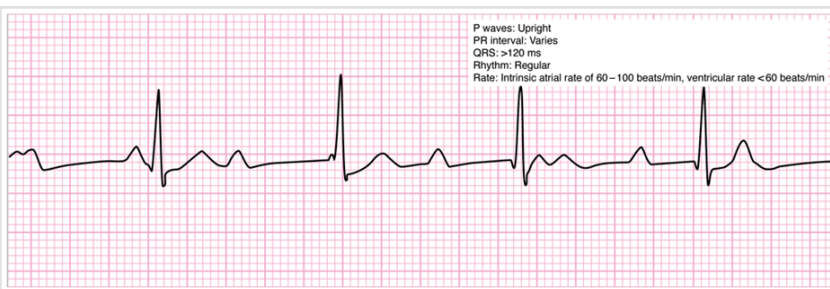
- Second-Degree AV Block— Type I - Wenckebach / Mobitz I



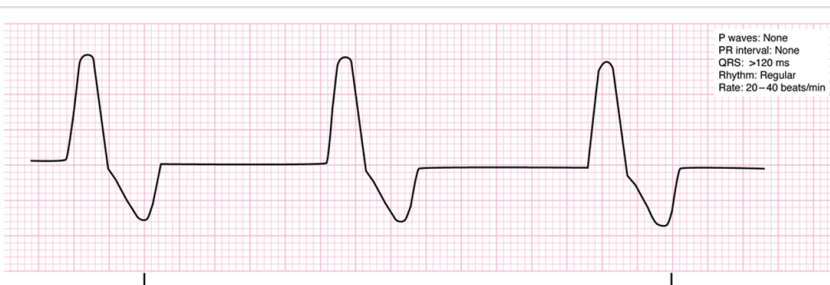
- Second-Degree AV Block—Type II - Mobitz II



- Third-Degree AV Block—Complete Heart Block



- Ventricular escape rhythms (Idioventricular Rhythms)



# Cardiac Arrest

## History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medication
- Existence of terminal illness
- Signs of lividity, rigor mortis
- DNR form

## Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

## Differential

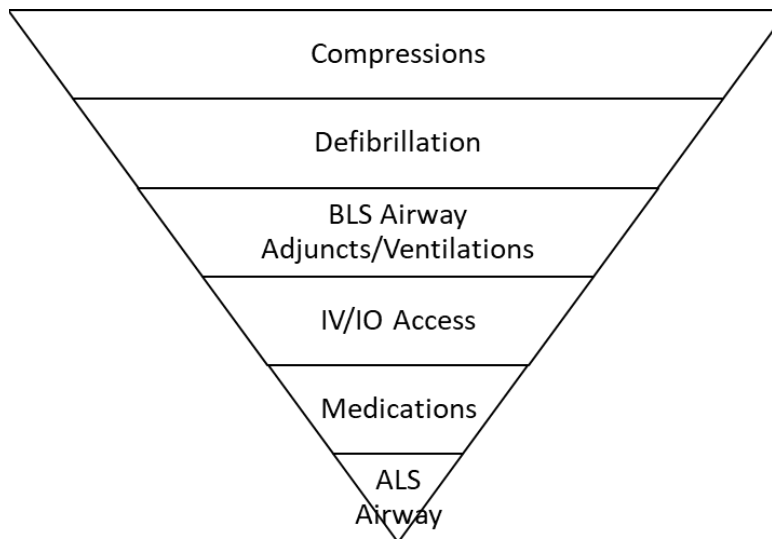
- Medical vs. Trauma
- V. fib vs Pulseless V. tach
- Asystole
- Pulseless Electrical Activity (PEA)

## High Performance CPR

- Chest Compressions at a depth of at least 2 inches
- Rate of compressions between 100-120 per minute
- Allowing for complete chest recoil
- Minimizing interruptions between cycles to less than 10 seconds (Compression fraction >60%)
- Switching providers frequently, about every 2 minutes or sooner if fatigued

## Code Resource Management

- Crews should coordinate their duties keeping the call priorities in mind. Intervention priorities are (in order of highest to lowest):



# Cardiac Arrest

## EMR & EMT-Basic

1. Check airway, breathing and circulation.
2. If pulseless, begin high quality CPR, apply AED and follow the prompts.
  - a. If the AED indicates "SHOCK ADVISED", call out "CLEAR!", check for the safety of others and follow the prompts on the AED to deliver the defibrillation.
  - b. Immediately resume CPR after defibrillation.
3. Ventilate with 100% oxygen.
4. Manage airway with appropriate adjunct. Refer to AIRWAY MANAGEMENT Protocol.
5. Follow current AHA BLS guidelines.
6. Relay information to incoming ambulance and/or initiate transport and call for intercept per INTERCEPT CRITERIA.
7. If return of pulses, refer to RETURN OF SPONTANEOUS CIRCULATION Protocol.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Ensure high quality CPR at all times.
3. Refer to appropriate dysrhythmia protocol:
  - a. ASYSTOLE / PEA
  - b. V-FIB / PULSELESS V-TACH
4. Keep the following in mind:
  - a. Rhythm checks, defibrillation and medications are completed at the top of the 2 minute cycle.
  - b. Compression fraction should be greater than 60% and EtCO<sub>2</sub> greater than 10 mmHg.
5. Consider placement of advanced airway per the AIRWAY MANAGEMENT Protocol.
6. If return of pulses, refer to RETURN OF SPONTANEOUS CIRCULATION Protocol.

# Cardiac Arrest

## - Asystole / PEA -

### History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medication
- Existence of terminal illness
- DNR form

### Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

### Differential

#### H's and T's

- Hypovolemia
- Hypoxia
- Massive Myocardial Infarction
- Tension Pneumothorax
- Acidosis / Hyperkalemia
- Toxins - Drug Overdose
- Hypothermia
- Pericardial Tamponade
- Massive Pulmonary Embolism

### H's and T's

- Hypovolemia – Volume infusion
- Hypoxia – Oxygenation & ventilation, CPR
- Hydrogen ion (acidosis) – Ventilation, CPR
- Hypo/Hyperkalemia
- Hypothermia - Warming
- Tension pneumothorax – Needle decompression
- Tamponade, cardiac – Volume infusion
- Toxins – Agent specific antidote
- Thrombosis, pulmonary – Volume infusion, Ventilation
- Thrombosis, coronary – Emergent PCI

### EMT-Intermediate

1. Initiate HIGH QUALITY CPR.
2. Establish IV/IO access.
3. **NORMAL SALINE** at **Wide Open** rate.
4. **EPINEPHRINE (1:10,000) 1 mg IV/IO every 3-5 minutes** as long as patient remains pulseless.
5. Consider possible causes and treatments (H's and T's).
6. Call for intercept per INTERCEPT CRITERIA.
7. If return of pulses, refer to the RETURN OF SPONTANEOUS CIRCULATION Protocol.

### Paramedic

1. Continue **ILS TREATMENT**.
2. Consider possible causes and treatments (H's and T's).
3. **SODIUM BICARBONATE 50 mEq IV/IO** for:
  - a. Known pre-existing hyperkalemia
  - b. Known overdose of Quinidine, tricyclic antidepressants, phenothiazines, antihistamines, cocaine
4. If return of pulses, refer to the RETURN OF SPONTANEOUS CIRCULATION Protocol.

# Cardiac Arrest

## - V-Fib / Pulseless V-Tach -

### History

- Estimated down time
- Past medical history
- Medications
- Events leading to arrest
- Renal failure / dialysis
- DNR or living will

### Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

### Differential

- Asystole
- Artifact / Device failure
- Cardiac
- Endocrine / Metabolic
- Drugs
- Pulmonary

### H's and T's

- Hypovolemia – Volume infusion
- Hypoxia – Oxygenation & ventilation, CPR
- Hydrogen ion (acidosis) – Ventilation, CPR
- Hypo/Hyperkalemia
- Hypothermia - Warming
- Tension pneumothorax – Needle decompression
- Tamponade, cardiac – Volume infusion
- Toxins – Agent specific antidote
- Thrombosis, pulmonary – Volume infusion, Ventilation
- Thrombosis, coronary – Emergent PCI

### EMT-Intermediate

1. Continue high quality CPR per CARDIAC ARREST Protocol pausing for rhythm checks every 2 minutes for no more than 10 seconds.
2. **DEFIBRILLATE** every 2 minutes as needed at manufacturers recommendations (**120-200J** biphasic or **360J** monophasic). Resume CPR immediately after defibrillation for 2 minutes.
3. Establish vascular access.
4. **EPINEPHRINE (1:10,000) 1.0 mg IV/IO every 3-5 minutes** as long as patient remains pulseless.
5. For V-fib/pulseless V-tach refractory to third defibrillation administer **AMIODARONE 300 mg IV/IO**; may repeat at 150 mg IV/IO in 5 minutes if needed.
6. If V-Fib or V-Tach persists or patient is allergic to AMIODARONE, consider **LIDOCAINE 1.5 mg/kg IV/IO**. May repeat every 3-5 minutes x 2 at **0.75 mg/kg** to maximum total dose of **3 mg/kg**.
7. If V-fib or V-tach is resolved with LIDOCAINE bolus, administer **LIDOCAINE infusion at 2-4 mg/min**.
8. Consider possible causes and treatments (H's and T's).
9. Continue cycles of 2 minutes of CPR followed by defibrillation as needed.
10. If Return of Spontaneous Circulation is achieved refer to ROSC Protocol.

### Paramedic

1. Continue **ILS TREATMENT**.
2. Consider **MAGNESIUM SULFATE 2 grams IV/IO** for Torsades de Pointes.



# Cardiac Arrest

## PEARLS

- Early and effective CPR and defibrillation are the most important therapies for cardiac arrest care.
- Team Focused Approach / Pit-Crew Approach recommended; assign responders to predetermined tasks.
- Efforts should be directed at high quality and continuous compressions with limited interruptions and early defibrillation when indicated.
- Consider early IO placement if available and/or difficult IV access anticipated.

## Compressions

- Minimize interruptions in chest compression, as pauses rapidly return the blood pressure to zero and stop perfusion to the heart and brain.
- Chest compressions should be reinitiated immediately after defibrillation as pulses, if present, are often difficult to detect and rhythm and pulse checks interrupt compressions.
- Continue chest compressions between completion of AED analysis and AED charging.
- Effectiveness of chest compressions decreases with any movements and thus patients should be resuscitated as close to the point at which they are first encountered and should only be moved if the conditions on scene are unsafe or do not operationally allow for resuscitation.
- Performing manual chest compressions in a moving vehicle may pose a provider safety concern.

## Ventilation

- Avoid excessive ventilation. IF no advanced airway (BIAD or ETT) compression to ventilation ratio is 30:2. If advanced airway is in place, ventilate 10 breaths per minute (1 ventilation every 6 seconds) with continuous, uninterrupted compressions.
- Do not interrupt compression to place endotracheal tube. Consider BIAD first to limit interruptions.
- Reassess and document BIAD and/or endotracheal tube placement and EtCO<sub>2</sub> frequently, after every move, and at transfer of care.

## EtCO<sub>2</sub>

- Quantitative end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be used to monitor effectiveness of chest compressions.
  - a. EtCO<sub>2</sub> > 10 mmHg is indicative of quality CPR.
  - b. Abrupt sustained increase in EtCO<sub>2</sub> is indicative of potential ROSC.

## Defibrillation

- Follow manufacture's recommendations concerning defibrillation energy. If the manufacturer's recommendation is unknown, use the highest setting possible.

## Mechanical CPR Devices

- Mechanical CPR devices should be used in accordance with the devices specific instructions.
- Mechanical CPR should not delay the initiation of high quality manual CPR.
- Interruptions in CPR to apply device should be limited to 10 seconds or less.

# Cardiac Arrest

## PEARLS

### Special Circumstances

- **Maternal Arrest:**
  - i. The best hope for fetal survival is maternal survival.
  - ii. Position the patient in the supine position with a second rescuer performing manual uterine displacement to the left in an effort to displace the gravid uterus and increase venous return by avoiding aorto-caval compression.
  - iii. If manual displacement is unsuccessful, the patient may be placed in the left lateral tilt position at 30°. This position is less desirable than the manual uterine displacement as chest compressions are more difficult to perform in this position.
  - iv. Chest compressions should be performed slightly higher on the sternum than in the non-pregnant patient to account for elevation of the diaphragm and abdominal contents in the obviously gravid patient.
  - v. Defibrillation should be performed as in non-pregnant patients.
- **Respiratory Arrests** (Drowning / Suffocation / Asphyxiation / Hanging)
  - i. Prompt attention to airway and ventilation is priority followed by high-quality and continuous chest compressions and early defibrillation.
- **Asystole / PEA**
  - i. Survival from PEA or Asystole is based on identifying and correcting the CAUSE. Consider a broad differential diagnosis, with early and aggressive treatment of possible causes.

## KEY DOCUMENTATION ELEMENTS

- Resuscitation attempted and all interventions performed
- Arrest witnessed
- Location of arrest
- First monitored rhythm
- CPR before EMS arrival
- Outcome
- Any ROSC
- Presumed etiology (Presumed cardiac, Trauma, Submersion, Respiratory, Other non-cardiac, Unknown )

## PERTINENT ASSESSMENT FINDINGS

- The patient in cardiac arrest requires a prompt balance of treatment and assessment
- In cases of cardiac arrest, assessments should be focused and limited to obtaining enough information to reveal the patient is pulseless
- Once pulselessness is discovered, treatment should be initiated immediately

## QUALITY METRICS

- Time to scene; Time to first CPR; Time to first intervention (shock/epi); Resuscitation Time; Time of ROSC
- Review of CPR Quality (Compression Fraction, Average and longest peri-shock pause, Rate and depth of compressions)
- Waveform capnography used for resuscitation, initial confirmation of advanced airway placement and continuous monitoring during transport

# Chest Pain / Acute Coronary Syndrome / STEMI

## History

- Age
- Medications (cardiac, erectile dysfunction medications)
- Past medical history (MI, Angina, Diabetes)
- Recent physical exertion
- Palliation / Provocation
- Quality (heaviness, tightness, pressure, constant, sharp, dull, etc.)
- Region / Radiation / Referred
- Severity (0-10)
- Time (onset / duration / repetition)

## Signs and Symptoms

- Chest Pain (pain, pressure, aching)
- Location (substernal, epigastric, arm, jaw, neck, shoulder)
- Radiation of pain
- Pale, diaphoresis
- Shortness of breath
- Nausea / Vomiting
- Dizziness
- Syncope

## Differential

- Trauma vs. Medical
- Angina vs. Myocardial Infarction (MI)
- Pericarditis
- Pulmonary Embolism (PE)
- Asthma / COPD
- Pneumothorax
- Aortic dissection or aneurysm
- GERD or Hiatal hernia
- Esophageal spasm
- Chest wall injury or pain
- Pleural pain
- Overdose (Cocaine or Methamphetamine)

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. Administer **ASPIRIN 325 mg PO** or **81 mg x 4 PO**; chewable, non-enteric-coated aspirin preferred.
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. For apparent cardiac related chest pain with SBP > 90 mmHg, administer **NITROGLYCERIN 0.4 mg SL.**
4. Repeat **NITROGLYCERIN** every 3-5 minutes to maximum of 3 doses as long as chest pain persists and **SBP > 90 mmHg** or **MAP > 65 mmHg.**
5. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT.**
2. Establish IV access.
3. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility. If dysrhythmia or ectopy present, proceed to appropriate protocol.
4. If **SBP > 90 mmHg**, apply **NITROGLYCERIN PASTE, 1 inch**, to patient's chest (*remove if SBP < 90 mmHg*).
5. If chest pain remains, administer **MORPHINE SULFATE 2 mg slow IV/IO over 1 minute.**
  - a. May consider **FENTANYL 1 mcg/kg slow IV/IO over 2-3 minutes** (maximum initial dose 100 mcg) instead of MORPHINE SULFATE.



## Medical Control



6. Medical Control may consider additional **MORPHINE SULFATE 2-4 mg IV/IO every 5 minutes** or additional **FENTANYL 1 mcg/kg slow IV/IO.**

# Chest Pain / Acute Coronary Syndrome / STEMI

## STEMI Criteria

1. Age > 18 years
2. Chest pain or equivalent symptoms consistent with cardiac ischemia or myocardial infarction.
  - a. i.e. "heartburn"/epigastric pain, palpitations, syncope, fatigue, shortness of breath, diaphoresis, ROSC post cardiac arrest.
3. STEMI Criteria (12-lead ECG):
  - a. Computer interpretation of the 12-lead is STEMI (i.e. **\*\*\*ACUTE MI\*\*\***).
  - b. ST segment elevation of  $\geq 1$  mm in 2 contiguous leads.
  - c. Interpretation of ECG transmitted and reviewed by a physician confirmed to be diagnostic of STEMI.

*\*\*If initial ECG is not diagnostic but suspicion remains high for ACS (acute coronary syndrome) and symptoms persist, obtain serial ECG's at 5-10 minute intervals*

**Goal:** First medical contact to ECG  $\leq 10$  min; Scene time  $\leq 15$  min.

## STEMI Destination Determination

### Transport time estimated to be $\leq 60$ minutes

1. Transport patient to the nearest PCI Capable Receiving Hospital via the most expedient method available.
  - a. Consider patient preference in deciding nearest PCI Capable Receiving Hospital.
  - b. Consider Air Transport when appropriate.
2. Activate "**STEMI ALERT**" at receiving facility and transmit 12-lead ECG for provider confirmation.
3. If patient demonstrates respiratory or hemodynamic instability that may require immediate ED evaluation and treatment by a physician, proceed to the nearest appropriate hospital.

### Transport time estimated to be $\geq 60$ minutes

1. Notify medical control and consider transport to the closest appropriate non-PCI capable referring hospital and subsequent urgent transfer to a PCI Capable Receiving Facility.
2. Activate "**STEMI ALERT**" at receiving facility and transmit 12-lead ECG for provider confirmation.

# Chest Pain / Acute Coronary Syndrome / STEMI

## PEARLS

- Acute coronary syndrome may present with atypical pain, vague or only generalized complaints.
- Observe for signs of clinical deterioration: dysrhythmias, CP, SOB, decreased LOC / syncope, or other signs of shock / hypotension.
- Perform serial 12-lead ECGs (especially any time clinical changes noted).
- The use of nitrates should be avoided in any patient who has used erectile dysfunction medications within the past 48 hours due to possible severe hypotension.
  - Examples: Viagra® / sildenafil, Levitra® / vardenafil, Cialis® / tadalafil
- Administer nitrates with extreme caution, if at all, to patients with inferior-wall STEMI or suspected right ventricular (RV) involvement because these patients require adequate RV preload.

\*\* Patients with STEMI should be transported to the appropriate destination based on the STEMI—EMS TRIAGE AND DESTINATION Protocol.

## KEY DOCUMENTATION ELEMENTS

- The time of symptom onset
- The time of patient contact by EMS to the time of 12-lead ECG acquisition
- The time ASA administered, or reason why not given
- The time of STEMI notification

## PERTINENT ASSESSMENT FINDINGS

- A complete medication list should be obtained from each patient. It is especially important for the treating physician to be informed if the patient is taking beta-blockers, calcium channel blockers, clonidine, digoxin, blood thinners (anticoagulants), and medications for the treatment of erectile dysfunction or pulmonary hypertension.

## QUALITY METRICS

- 12-Lead ECG in ≤ 10 minutes and transmitted
- Aspirin administration for chest pain / discomfort
- Scene time for STEMI patients
- Advance hospital notification for suspected STEMI
- Direct transport to PCI capable receiving hospital for suspected STEMI patients meeting criteria

# Chest Pain / Acute Coronary Syndrome / STEMI

## Region 6 STEMI Destination Determination

**Purpose:** To facilitate rapid transport of patients suspected of having a STEMI to the appropriate Percutaneous Coronary Intervention (PCI) capable facility.

**Policy:** Any patient meeting the STEMI criteria outlined below should be transported directly to a PCI capable facility. Contact the Resource Hospital for direction as soon as possible if questions exist regarding a specific patient or situation.

**Airway compromise or management by a Basic level EMS provider without ALS intercept should be transported to the nearest facility.**

IDPH Region 6 PCI Capable Facilities		
Decatur Memorial Hospital	2300 N Edward St	Decatur, IL
HSHS St. Mary's Hospital	1800 East Lake Shore Dr	Decatur, IL
Carle Foundation Hospital	611 W Park St	Urbana, IL
OSF HealthCare Heart of Mary Medical Center	1400 W Park St	Urbana, IL

# CHF / Pulmonary Edema

## History

- Congestive Heart Failure (CHF)
  - Use of diuretics and compliance
  - Weight gain
  - Leg swelling
  - Orthopnea
- Past Medical History
- Medications (Digoxin, Lasix)
- Erectile Dysfunction Medication
- Cardiac History (prior MI)

## Signs and Symptoms

- Respiratory distress (crackles / rales)
- Lower extremity edema
- Orthopnea
- Jugular Vein Distention (JVD)
- Pink, frothy sputum
- Diaphoresis
- Hypotension, shock
- Chest pain

## Differential

- Myocardial Infarction (MI)
- CHF
- Asthma / COPD
- Anaphylaxis
- Aspiration
- Pleural effusion
- Pneumonia
- Pulmonary Embolus (PE)
- Pericardial tamponade
- Toxic exposure

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. **UNIVERSAL PATIENT CARE.**
  - a. Apply cardiac monitor and obtain 12-Lead ECG – Transmit to receiving facility.
2. Establish IV access.
3. If SBP > 90 mmHg or MAP > 65 mmHg:
  - a. Administer **NITROGLYCERIN 0.4 mg SL x1**.
  - b. Apply CPAP.
  - c. Apply **NITROGLYCERIN PASTE, 1 inch**, to patient's chest (*remove if SBP < 90 mmHg or MAP < 65 mmHg*).
  - d. Consider additional **NITROGLYCERIN 0.4 mg SL every 5 minutes x 2 doses**.
    - If CPAP is already applied, do not remove CPAP to administer NITRO.
4. If wheezing is present and if EtCO<sub>2</sub> waveform supports concurrent bronchospasm refer to BRONCHOSPASM / ASTHMA / COPD Protocol.

## Paramedic

1. Continue **ILS TREATMENT**.
2. If signs of Cardiogenic Shock, consider **NOREPINEPHRINE (Levophed) 2-30 mcg/min** (if available, with IV pump) titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

Alternative medication: **DOPAMINE** at **5mcg/kg/min** titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

\*\*\*While drip is being set up, consider **PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO** every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP > 65 mmHg.

  - a. Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/mL.

# CHF / Pulmonary Edema

## PEARLS

- Consider Myocardial Infarction (MI) in all these patients.
- Allow patient to remain in position of comfort - patients may decompensate if forced to lie down.
- The use of nitrates should be avoided in any patient who has used erectile dysfunction medications within the past 48 hours due to possible severe hypotension.
  - Examples: Viagra® / sildenafil, Levitra® / vardenafil, Cialis® / tadalafil
- Administer nitrates with extreme caution, if at all, to patients with inferior-wall STEMI or suspected right ventricular (RV) involvement because these patients require adequate RV preload.
- Use of Furosemide (Lasix®) is not recommended in the prehospital setting. Pulmonary edema is more commonly a problem of volume distribution than overload, so administration of Furosemide provides no immediate benefit for most patients. Misdiagnosis of CHF and subsequent inducement of inappropriate diuresis can lead to increased morbidity and mortality in patients.
- **Cardiogenic Shock:** Heart failure, MI, Cardiomyopathy, Myocardial contusion, Ruptured ventricle/septum/valve, Toxins.

## KEY DOCUMENTATION ELEMENTS

- Vital signs
- Oxygen saturation
- Time of intervention
- Response to interventions

## PERTINENT ASSESSMENT FINDINGS

- Full vital signs
- Respiratory distress
- Breath sounds (crackles / rales)
- Edema
- JVD

## QUALITY METRICS

- Time to initiation of CPAP
- Assessment / auscultation of lung sounds before and after each intervention



# Return of Spontaneous Circulation

## History

- Respiratory arrest
- Cardiac arrest

## Signs and Symptoms

- Return of Spontaneous Circulation (ROSC) post cardiac arrest

## Differential

- Continue to address rhythm specific differentials

## EMR

1. Reassess Airway, Breathing and Circulation.
  - a. If ventilation assistance is required, ventilate at 10-12 breaths per minute.
  - b. Do not hyperventilate.
  - c. Titrate to maintain oxygen saturation  $\geq 94\%$ .
2. Provide **UNIVERSAL PATIENT CARE**.
3. Consider TARGETED TEMPERATURE MANAGEMENT Protocol.
4. Relay information to incoming ambulance.
5. Reassess patient. If patient becomes pulseless, begin CPR and follow CARDIAC ARREST Protocol.

## EMT-Basic

1. Continue **EMR TREATMENT**.
2. Obtain 12-Lead ECG and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT**.
2. Obtain 12 Lead ECG and transmit to receiving facility.
3. Treat hypotension (SBP < 90 mmHg or MAP < 65 mmHg) according to SHOCK Protocol.
4. Monitor EtCO<sub>2</sub>. Target 35-40 mmHg.
5. If no advanced airway, consider placement of advanced airway per the AIRWAY MANAGEMENT Protocol.
6. Initiate transport.

## Paramedic

1. Continue **ILS TREATMENT**.
2. For hypotension not responsive to fluid boluses, consider **NOREPINEPHRINE (Levophed) 2-30 mcg/min** (if available, with IV pump) titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

Alternative medication: **DOPAMINE** at **5mcg/kg/min** titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.

\*\*\*While drip is being set up, consider **PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO** every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP > 65 mmHg.

- a. Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/mL.

# Return of Spontaneous Circulation / Targeted Temperature Management

## History

- Non-traumatic cardiac arrest
- Any presenting ECG rhythm
- Age > 18

## Signs and Symptoms

- Cardiac arrest
- Return of Spontaneous Circulation (ROSC) post cardiac arrest

## Differential

- Continue to address rhythm specific differentials

## Targeted Temperature Management Criteria

1. Age > 18.
2. Return of Spontaneous Circulation (ROSC) not related to trauma, including intracranial hemorrhage.
3. Temperature after ROSC greater than 34°C / 93.2°F.
4. Advanced airway (including BIAD) in place with no purposeful response to verbal or painful stimuli.
5. Not pregnant.

## EMR & EMT-Basic

1. Apply ice packs to bilateral neck, groin and axillae. Change ice packs every 15 minutes or more frequently as necessary.
2. Do not allow patient to shiver.
3. Do not hyperventilate.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Do not allow patient to shiver. May use **MIDAZOLAM 0.05 mg/kg IV/IO every 3-5 minutes** as needed (total maximum dose 10mg).
3. Monitor EtCO<sub>2</sub>; target 35-40 mmHg.

# Return of Spontaneous Circulation

## PEARLS

- Hyperventilation is a significant cause of hypotension and recurrence of cardiac arrest in the post resuscitation phase and must be avoided.
- Most patients immediately post resuscitation will require ventilatory assistance.
- The condition of post-resuscitation patients fluctuates rapidly and continuously, and they require close monitoring. A significant percentage of post-ROSC patients will re-arrest.
- A moderate number of post-ROSC patients may have evidence of ST elevation MI on ECG.
- Common causes of post-resuscitation hypotension include hyperventilation, hypovolemia, and pneumothorax.

## Targeted Temperature Management

- Maintain core temperature between 32°-36°C (89.6°-96.8°F)
- Infusion of cold saline is NOT recommended in the prehospital setting

## KEY DOCUMENTATION ELEMENTS

- Immediate post-arrest rhythms
- Vitals Signs
- Neurologic assessment
- Post-ROSC 12-lead ECG

## PERTINENT ASSESSMENT FINDINGS

- Asses post-ROSC rhythm, lung sounds and for signs of hypoperfusion

## QUALITY METRICS

- Percent of patients receiving Targeted Temperature Management post-ROSC
- Percent of patient receiving a post-ROSC 12-lead ECG

# Return of Spontaneous Circulation

Intentionally Left  
Blank

Adult Cardiac

# Syncope / Pre-Syncope

## History

- History of prior syncopal episodes
- Cardiac history (CAD, CHF, Dysrhythmias)
- Stroke history
- Seizure history
- Recent trauma
- Occult blood loss (GI/GU)
- Fluid losses (Nausea, Vomiting, Diarrhea)
- Past medical history
- Medications

## Signs and Symptoms

- Loss of consciousness with recovery
- Lightheadedness / Dizziness
- Palpitations, slow or rapid pulse
- Pulse irregularity
- Decreased blood pressure

## Differential

- Vasovagal
- Orthostatic hypotension
- Cardiac syncope
- Micturition / Defecation syncope
- Psychiatric
- Stroke
- Hypoglycemia
- Seizure
- Shock (see Shock Protocol)
- Toxicological (Alcohol)
- Medication effect (hypotension)
- AAA
- PE

## Definitions

**Syncope:** Loss of consciousness and postural tone that resolves spontaneously without medical interventions.

**Pre-Syncope:** Prodromal symptoms of syncope. Usually lasts for seconds to minutes and may be described by the patient as “nearly blacking out” or “nearly fainting”.

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. If blood glucose < 60 mg/dL (or suspected), refer to DIABETIC EMERGENCIES Protocol.
3. Evaluate for hemorrhage and treat for shock if indicated. Refer to SHOCK Protocol.
4. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT.**
2. Obtain 12-Lead ECG and transmit to receiving facility.
3. Establish IV access.
4. Monitor for dysrhythmias closely. If dysrhythmia present, follow appropriate dysrhythmia protocol.

# Syncope / Pre-Syncope

## PEARLS

- Patients suffering syncope due to arrhythmia may suffer recurrent arrhythmia and should therefore be placed on a cardiac monitor.
- Geriatric patients suffering falls from standing may sustain significant injury and should be diligently screened for trauma.
- By being most proximate to the scene and to the patient's presentation, EMS providers are commonly in a unique position to identify the cause of syncope. Consideration of potential causes, ongoing monitoring of vitals and cardiac rhythm as well as detailed exam and history are essential pieces of information to pass onto hospital providers.
- All patients suffering from syncope deserve hospital level evaluation, even if they appear normal with few complaints on scene.
- High risk causes of syncope include the following:
  - a. Cardiovascular
    - i. Myocardial infarction
    - ii. Aortic stenosis
    - iii. Hypertrophic cardiomyopathy
    - iv. Pulmonary embolus
    - v. Thoracic aortic dissection
    - vi. Lethal dysrhythmia
  - b. Neurovascular
    - i. Intracranial hemorrhage
    - ii. Transient ischemic attack or stroke
- Consider high risk 12-lead ECG features including, but not limited to:
  - a. Evidence of QT prolongation (generally over 500ms).
  - b. Delta waves.
  - c. Brugada syndrome (incomplete RBBB pattern in V1/V2 with ST segment elevation).
  - d. Hypertrophic obstructive cardiomyopathy

## KEY DOCUMENTATION ELEMENTS

- Presenting cardiac rhythm
- Cardiac rhythm present when patient is symptomatic
- Any cardiac rhythm changes
- Full vital signs, including blood glucose

## PERTINENT ASSESSMENT FINDINGS

- Evidence of trauma
- Evidence of cardiac dysfunction (e.g. evidence of CHF, arrhythmia)
- Evidence of hemorrhage
- Evidence of neurologic compromise
- Evidence of alternate etiology, including seizure
- Initial and ongoing cardiac rhythm
- 12-lead ECG findings

## QUALITY METRICS

- Acquisition of 12-lead ECG
- Application of cardiac monitor
- Blood glucose obtained

# Tachycardia (with a Pulse)

## Narrow Complex (< 0.12 sec) - REGULAR Rhythm

### History

- Medications  
(Aminophylline, Diet pills, Thyroid supplements, Decongestants, Digoxin)
- Diet (caffeine, chocolate)
- Drugs (nicotine, cocaine)
- Past medical history
- History of palpitations / heart racing
- Syncope / Near syncope

### Signs and Symptoms

- Heart rate > 150
- Dizziness
- Chest pain
- Palpitations
- Shortness of breath
- AMS
- Diaphoresis
- CHF

### Differential

- Heart disease (WPW, Valvular)
- Sick sinus syndrome
- Myocardial infarction
- Electrolyte imbalance
- Fever, pain, emotional stress
- Hypoxia, Hypovolemia or Anemia
- Drug effect / Overdose (see HX)
- Hyperthyroidism
- Pulmonary embolus
- Sepsis

## EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. **UNIVERSAL PATIENT CARE**
  - a. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility.
2. Establish IV access - preferably large bore in AC.
3. Consider **NORMAL SALINE 500 mL bolus** to rule out hypovolemia/dehydration as cause of tachycardia. Repeat fluid bolus as needed as long as lungs remain clear; maximum **2 liters**.

### STABLE

1. Perform vagal maneuvers.
2. **ADENOSINE 6 mg rapid IV/IO** followed by a 10 mL NS flush.
  - a. If underlying rhythm is Atrial Fibrillation or Atrial Flutter refer to TACHYCARDIA, NARROW COMPLEX - IRREGULAR RHYTHM Protocol.
3. If no change in rhythm after 1-2 minutes, **ADENOSINE 12 mg rapid IV/IO** followed by a 10 mL NS flush.
4. If no change in rhythm after 1-2 minutes, repeat **ADENOSINE 12 mg rapid IV/IO** followed by a 10 mL NS flush.

### UNSTABLE (*Hypotension, Chest Pain with evidence of ischemia, AMS, signs of shock, acute CHF*)

1. Immediate SYNCHRONIZED CARDIOVERSION at **100J**.
  - a. If normal LOC, consider sedation with **MIDAZOLAM 2 mg IV/IO**.
2. If no response to initial energy dose, repeat SYNCHRONIZED CARDIOVERSION in stepwise fashion (i.e. 200J-300J-360J)
3. If cardioversion is successful, obtain 12-Lead ECG.

# Tachycardia (with a Pulse)

## Narrow Complex (< 0.12 sec) - IRREGULAR Rhythm

### EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

### EMT-Intermediate

#### STABLE

1. **UNIVERSAL PATIENT CARE.**
  - a. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving.
2. Establish IV access - preferably large bore in AC.
3. Consider **NORMAL SALINE 500 mL bolus** to rule out hypovolemia/dehydration as cause of tachycardia. Repeat fluid bolus as needed as long as lungs remain clear; maximum **2 liters**.

#### UNSTABLE (*Hypotension, Chest Pain with evidence of ischemia, AMS, signs of shock, acute CHF*)

1. Immediate SYNCHRONIZED CARDIOVERSION at **120-200J**
  - a. If normal LOC, consider sedation with **MIDAZOLAM 2 mg IV/IO**.
2. If no response to initial energy dose, repeat SYNCHRONIZED CARDIOVERSION in stepwise fashion (i.e. 200J-300J-360J).
3. If cardioversion is successful, obtain 12-Lead ECG.

### Paramedic

#### STABLE

1. Continue **ILS Treatment**.
2. **DILTIAZEM 0.25 mg/kg slow IV/IO push over 2-5 minutes** if SBP > 100.
  - a. ACLS guidelines recommend 15 to 20 mg; **Max dose 20mg**.
  - b. For patients older than 65, recommended initial dose of **10mg IV**.
3. If A-fib or A-flutter persists after 15 minutes, consider **DILTIAZEM 0.35 mg/kg slow IV/IO push over 2-5 minutes** if SBP > 100.
  - a. ACLS guidelines recommend 20 to 25 mg; Max dose 25mg.
  - b. For patients older than 65, recommended second dose of **20mg IV**.
4. If responsive to CARDIZEM bolus, may start **DILTIAZEM maintenance infusion** at **10-15 mg/hr**.
  - a. DILTIAZEM infusion: mix DILTIAZEM 100 mg in 100 mL 0.9% Normal Saline to give you 1 mg/mL concentration.
  - b. Use 60 drop IV set and 10-15 drops/minute is equivalent to 10-15 mg/hr
5. If patient converts, obtain a repeat 12-Lead ECG
6. If A-fib or A-flutter persists, consider SYNCHRONIZED CARDIOVERSION (*see ILS treatment above*).

#### UNSTABLE (*Hypotension, Chest Pain with evidence of ischemia, AMS, signs of shock, acute CHF*)

1. Immediate SYNCHRONIZED CARDIOVERSION (*see ILS treatment above*).



# Tachycardia (with a Pulse)

## Wide Complex (> 0.12 sec)

### History

- Past medical history (pacemaker)
- Medications
- Diet
- Drugs
- Syncope / Near syncope
- CHF
- Palpitations

### Signs and Symptoms

- Wide complex tachycardia on ECG (QRS > 0.12 sec)
- Conscious, rapid pulse
- Chest pain
- Shortness of breath
- Dizziness
- AMS
- Diaphoresis

### Differential

- Artifact / Device failure
- Cardiac
- Endocrine / Metabolic
- Drugs
- Pulmonary

## EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Perform 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT**.
  - a. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility.
2. Establish IV access - preferably large bore in AC.
3. Consider **NORMAL SALINE 500 mL bolus** to rule out hypovolemia/dehydration as cause of tachycardia. Repeat fluid bolus as needed as long as lungs remain clear; maximum **2 liters**.

### STABLE

1. Administer **AMIODARONE 150 mg IV/IO over 10 minutes**. May repeat **AMIODARONE** every 10 minutes until wide complex tachycardia resolves to a maximum dose of **450 mg**.
2. For patients with allergy or no response to AMIODARONE, consider **LIDOCAINE 1.5 mg/kg IV/IO**. May **repeat every 3-5 minutes x 2 at 0.75 mg/kg** to maximum total dose of **3 mg/kg**.
3. If tachycardia resolves with LIDOCAINE bolus, administer **LIDOCAINE** infusion at **2-4 mg/min**.

### UNSTABLE

1. If altered LOC, immediate SYNCHRONIZED CARDIOVERSION at **100J**.
  - a. If normal LOC, consider sedation with **MIDAZOLAM 2 mg IV/IO**.
2. If no response to initial energy dose, repeat SYNCHRONIZED CARDIOVERSION in stepwise fashion (i.e. 200J-300J-360J).
3. If cardioversion is successful obtain 12-Lead ECG.
4. If the patient becomes pulseless at any time, refer to the CARDIAC ARREST and/or V-FIB/PULSELESS V-TACH Protocol.

## Paramedic

1. Continue **ILS TREATMENT**
2. For Polymorphic V-Tach / Torsades de Pointes, consider **MAGNESIUM SULFATE 2 grams IV/IO** over 10 minutes.

# Tachycardia (with a Pulse)

## PEARLS

**Unstable:** Hypotension, Chest Pain with evidence of ischemia, AMS, signs of shock, acute CHF

**Regular Narrow Complex Tachycardia** - SVT

**Irregular Narrow Complex Tachycardia** - Atrial fibrillation, atrial flutter, multifocal atrial tachycardia

**Regular Wide Complex Tachycardia** - Ventricular tachycardia, supraventricular tachycardia, atrial fibrillation/flutter with aberrancy, accelerated idioventricular rhythms, pre-excited tachycardias with accessory pathways

**Irregular Wide Complex Tachycardia** - atrial fibrillation with aberrancy, pre-excited atrial fibrillation (i.e. atrial fibrillation using an accessory pathway), polymorphic VT / torsades de pointes (treat with Mag Sulfate)

- Consider causes for tachycardia (hypovolemia, hypoxia, hydrogen (acidosis), myocardial infarction, hypokalemia / hyperkalemia, hypoglycemia, hypothermia, toxins / overdose, tamponade, tension, pneumothorax , thrombus – central or peripheral, trauma, hyperthyroidism).
- Atrial fibrillation rarely requires cardioversion in the field. As it is difficult to ascertain onset of rhythm, risk of stroke needs to be considered prior to cardioversion
- A wide-complex irregular rhythm should be considered pre-excited atrial fibrillation; extreme care must be taken in these patients
  - a. Characteristic ECG findings include a short PR interval and, in some cases, a delta wave
  - b. Avoid AV nodal blocking agents such as Adenosine, calcium channel blockers, Digoxin, and possibly beta-blockers in patients with pre-excitation atrial fibrillation (e.g. Wolff-Parkinson-White Syndrome, Lown-Ganong-Levine Syndrome) because these drugs may cause a paradoxical increase in the ventricular response.
  - c. Blocking the AV node in some of these patients may lead to impulses that are transmitted exclusively down the accessory pathway, which can result in ventricular fibrillation.
- Calcium Channel Blocker administered ONLY with narrow complex tachydysrhythmia.
- Adenosine may not be effective in identifiable atrial flutter/fibrillation, yet is not harmful.

## \*\*MODIFIED VALSALVA MANEUVER

1. Have patient blow through a 10 cc syringe in a semi recumbent position for 15 seconds
2. Lay patient flat and lift their legs to 45 degrees for 15 seconds
3. Return patient to the semi recumbent position for 45 seconds before reassessing cardiac rhythm

## KEY DOCUMENTATION ELEMENTS

- Initial rhythm and all rhythm changes
- Time, dose and response to meds given
- Cardioversion times, attempts, joules and response
- Obtain monitor strips after each intervention

## PERTINENT ASSESSMENT FINDINGS

## QUALITY METRICS

- Correct medication and dose given
- Correct cardioversion joules delivered

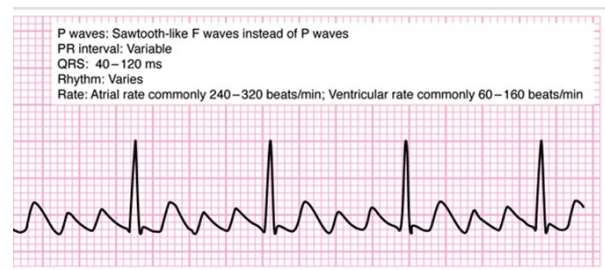
# Tachycardia (with a Pulse)

## Rhythms

- Supraventricular Tachycardia (SVT)



- Atrial Fibrillation / Atrial Flutter



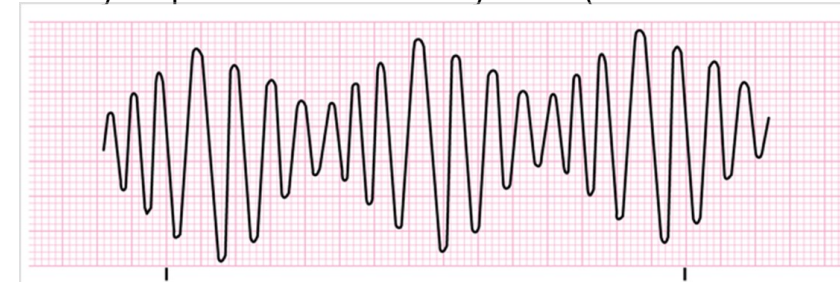
- Multifocal Atrial Tachycardia (MAT)



- Monomorphic Ventricular Tachycardia



- Polymorphic Ventricular Tachycardia (Torsades de Pointes)



# Tachycardia (with a Pulse)

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# Ventricular Assist Device (VAD)

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Inspect VAD control for model name and alarms.
3. Assess for possible pump malfunction.
  - a. Assess for alarms.
  - b. Auscultate for pump sound “hum”.
  - c. Signs of hypoperfusion including pallor, diaphoresis, ALTERED MENTAL STATUS.
4. If the VAD pump has malfunctioned:
  - a. Utilize available resources to troubleshoot potential VAD malfunctions and to determine appropriate corrective actions to restore normal VAD function.
    - i. Contact the patient’s VAD-trained companion, if available.
    - ii. Contact the patient’s VAD coordinator, using the phone number on the device.
    - iii. Check all the connections to system controller.
    - iv. Change VAD batteries, and/or change system controller if indicated
    - v. Have patient stop all activity and assess for patient tolerance.
    - vi. Follow appropriate cardiovascular condition-specific protocol(s) as indicated.
5. If patient is in full cardiac arrest:
  - a. CPR should not be performed if there is any evidence the pump is still functioning, the decision whether to perform CPR should be made based upon best clinical judgment in consultation with the patient’s VAD-trained companion and the VAD coordinator (or direct medical oversight if VAD coordinator unavailable).
  - b. CPR may be initiated only where:
    - i. You have confirmed the pump has stopped and troubleshooting efforts to restart it have failed, and
    - ii. The patient is unresponsive and has no detectable signs of life
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.
7. Be sure patient brings back up power sources (batteries, charger, etc.), and hand pump (if applicable).

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Monitor ECG. If there is a pulse, the rhythm may not correlate with it.
3. Obtain 12-lead ECG. Follow appropriate protocol if STEMI or dysrhythmia present.
4. Establish IV access
5. If VAD is functioning and signs of hypoperfusion and lungs are clear, administer **NORMAL SALINE 250 mL fluid bolus** over 10 minutes. May repeat once, up to a total of 500ml or until MAP > 65 mmHg.

# Ventricular Assist Device (VAD)

## PEARLS

MyLVAD EMS Guide: <https://www.mylvad.com/medical-professionals/resource-library/ems-field-guides>

- Deciding when to initiate Chest Compressions is very difficult. Consider that chest compressions **may cause death by exsanguination** if the device becomes dislodged. However, if the pump has stopped the heart will not be able to maintain perfusion and the patient will likely die. Ideally, plan the decision in advance with a responsive patient and the VAD coordinator. IF a VAD patient is unresponsive and pulseless with a non-functioning pump and has previously indicated a desire for resuscitative efforts, begin compression. Contact the VAD coordinator and Medical Control.
- You do not need to disconnect the controller or batteries in order to:
  - a. Defibrillate or cardiovert
  - b. Acquire a 12-lead ECG
- Automatic non-invasive cuff blood pressures may be difficult to obtain due to the narrow pulse pressure created by the continuous flow pump.
- Flow though many VAD devices is not pulsatile and patients may not have a palpable pulse or accurate pulse oximetry.
- The blood pressure, if measurable, may not be an accurate measure of perfusion.
- Ventricular fibrillation, ventricular tachycardia, or asystole/PEA may be the patient's "normal" underlying rhythm. Evaluate clinical condition and provide care in consultation with VAD coordinator
- The patient's travel bag should accompany them at all times with back-up controller and spare batteries
- If feasible, bring the patient's power module, cable, and display module to the hospital
- All patients should carry a spare pump controller with them
- The most common cause for VAD alarms are low batteries or battery failures
- Although automatic non-invasive blood pressure cuffs are often ineffective in measuring systolic and diastolic pressure, if they do obtain a measurement, the MAP is usually accurate
- Other VAD complications:
  - a. Infection
  - b. Stroke/TIA
  - c. Bleeding
  - d. Arrhythmias
  - e. Cardiac tamponade
  - f. CHF
  - g. Aortic insufficiency

## KEY DOCUMENTATION ELEMENTS

- Information gained from the VAD control box indicating any specific device malfunctions
- Interventions performed to restore a malfunctioning VAD to normal function
- Time of notification to and instructions from VAD-trained companion and/or VAD coordinator

## PERTINENT ASSESSMENT FINDINGS

- Asses for possible pump malfunction by assess for alarms, auscultating for pump sound and looking for signs of hypoperfusion

## QUALITY METRICS

- Identify and mitigate any correctable VAD malfunctions
- Perform CPR for patients in cardiac arrest when indicated



# Childbirth / Labor

## History

- Due date
- Time contractions started / how often
- Rupture of membranes
- Time / amount of any vaginal bleeding
- Sensation of fetal activity
- Past medical and delivery history
- Medications
- Gravida / Para Status
- High risk pregnancy

## Signs and Symptoms

- Spasmodic pain
- Vaginal discharge or bleeding
- Contractions
- Crowning or urge to push
- Membrane rupture
- Meconium

## Differential

- Abnormal presentation
  - Buttock
  - Foot
  - Hand
- Prolapsed cord
- Placenta previa
- Abruptio placenta

## All Levels

1. **UNIVERSAL PATIENT CARE.**
2. Examine perineum for crowning.
3. If crowning is not present:
  - a. Prepare for transport. Consider transporting patient in left lateral recumbent position if able.
  - b. Frequently reassess for crowning.
4. If crowning present, prepare for delivery.
  - a. Encourage the patient to perform slow steady pushes with contractions.
  - b. Support the head with gentle pressure as it presents. Delivery should be controlled in order to allow a slow controlled delivery of infant to prevent injury to mother.
  - c. After delivery of head, suction airway orally then nasally.
  - d. Check for and reduce a nuchal cord if present. If unable to free the cord from the neck, double clamp the cord and cut between the clamps.
  - e. Grasping the head with hand over the ears, gently guide head down to allow delivery of the anterior shoulder.
  - f. Gently guide the head up to allow delivery of the posterior shoulder.
  - g. Slowly deliver the remainder of the infant.
  - h. After 1-3 minutes, clamp cord about 6 inches from the abdomen with 2 clamps; cut the cord between the clamps.
  - i. Keep baby positioned level with mother's heart until cord is cut.
5. Record APGAR scores at 1 and 5 minutes.
6. Provide routine neonatal care (dry, warm, position, suction, stimulate). Refer to NEWBORN CARE / NEONATAL RESUSCITATION Protocol
7. Wrap baby to preserve warmth, and place on mother's abdomen or chest.
8. The placenta will deliver spontaneously, often within 5-15 minutes of the infant.
  - a. Never pull on cord in an attempt to hasten delivery.
9. After delivery, massaging the uterus and allowing the infant to nurse will promote uterine contraction and help control bleeding.
10. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

Protocol Continues

# Childbirth / Labor

## EMR & EMT-Basic

1. If complications of delivery occur, the following are recommended:
  - a. **Shoulder dystocia** - If delivery fails to progress after head delivers, quickly attempt the following
    - i. Hyperflex mother's hips to severe supine knee-chest position.
    - ii. Apply firm suprapubic pressure to attempt to dislodge shoulder.
    - iii. Apply high-flow oxygen to mother.
  - b. **Prolapsed Umbilical Cord**
    - i. Place gloved hand into vagina and gently lift head / body off of cord.
      - Do not remove your hand. Maintain until relieved by hospital staff.
    - ii. Consider placing mother in prone knee-chest position or extreme Trendelenburg.
    - iii. Apply high-flow oxygen to mother.
    - iii. Transport as soon as possible.
  - c. **Breech Birth**
    - i. Place mother supine, allow the buttocks and trunk to deliver spontaneously, then support the body while the head is delivered.
    - ii. If head fails to deliver, place gloved hand into vagina with fingers between infant's face and uterine wall to create an open airway.
    - iii. Apply high-flow oxygen to mother.
    - iv. Transport as soon as possible.
    - v. The presentation of an arm or leg through the vagina is an indication for immediate transport to hospital.
    - vi. Assess for presence of prolapsed cord and treat as above.
  - d. Excessive bleeding during active labor may occur with placenta previa.
    - i. Obtain history from patient.
    - ii. Placenta previa may prevent delivery of infant vaginally.
    - iii. C-section needed—transport urgently.
  - e. Maternal Cardiac Arrest
    - i. Apply manual pressure to displace uterus from right to left.
    - ii. Treat per CARDIAC ARREST Protocol.
    - iii. Transport as soon as possible.
2. Contact Medical Control for direct medical oversight and make the receiving facility aware of your arrival.
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Consider **NORMAL SALINE 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters**.



# Childbirth / Labor

## PEARLS

- Some bleeding is normal with any childbirth. Large quantities of blood or free bleeding are abnormal.
- Supine Hypotension Syndrome:
  - a. If mother has hypotension before delivery, place patient in left lateral recumbent position or manually displace gravid uterus to the left if supine position necessary.
  - b. Knee-chest position may create safety issues during rapid ambulance transport

APGAR Score			
Sign	0	1	2
Appearance	Blue, Pale	Body pink, Extremities blue	Completely pink
Pulse	Absent	< 100	> 100
Grimace	No response	Grimace	Cough or Sneeze
Activity	Limp	Some flexion	Active motion of extremities
Respirations	Absent	Slow, Irregular	Good, Crying

## KEY DOCUMENTATION ELEMENTS

- Document all times (delivery, contraction frequency and length)
- Document any complication with delivery

## PERTINENT ASSESSMENT FINDINGS

- Signs of imminent delivery:
  - a. Contractions
  - b. Crowning
  - c. Urge to push
  - d. Urge to move bowels
  - e. Membrane rupture
  - f. Bloody show

## QUALITY METRICS

- Documentation of APGAR scores
- Recognition of complications

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# Eclampsia / Pre-Eclampsia

## History

- Past medical history
- Hypertension medications
- Prenatal care
- Prior pregnancies / births
- Gravida / Para

## Signs and Symptoms

- Hypertension
- Seizures
- Severe headaches
- Visual changes
- Edema of hands and face
- Abdominal pain

## Differential

- Pre-eclampsia
- Eclampsia
- Seizures
- Hypertension

## Definitions

*Female patients > 20 weeks gestation and < 4 weeks post-partum*

**Pre-Eclampsia:** In the setting of pregnancy, hypertension defined as a SBP > 140 or DBP > 90 mmHg in previously normotensive patient. Symptoms of headache, vision changes, confusion, abdominal pain, pulmonary edema.

**Eclampsia:** Pre-Eclampsia with the development of seizures.

## EMR & EMT- Basic

1. **UNIVERSAL PATIENT CARE.**
2. Obtain history and vital signs.
  - a. Gestational age or recent post-partum.
  - b. Symptoms suggestive of end organ involvement such as headache, confusion, visual disturbances, seizure, epigastric pain, right upper quadrant pain, nausea and vomiting.
  - c. Previous history of hypertension or known pre-eclampsia.
3. Place patient in left lateral recumbent position.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If pregnant patient develops seizures refer to SEIZURE / STATUS EPILEPTICUS Protocol and call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.



**Medical Control**



2. Medical Control may consider **MAGNESIUM SULFATE 4 g IV** in 50 mL NS over 10-20 minutes for seizures associated with pregnancy greater than 20-weeks gestation.

# Eclampsia / Pre-Eclampsia

## PEARLS

- Delivery of the placenta is the only definitive management for pre-eclampsia and eclampsia.
- Early treatment of severe pre-eclampsia with magnesium and anti-hypertensive significantly reduces the rate of eclampsia - use of magnesium encouraged if signs of severe pre-eclampsia present to prevent seizure.
- Magnesium toxicity (progression)
  - a. Hypotension followed by
  - b. Loss of deep tendon reflexes followed by
  - c. Somnolence, slurred speech followed by
  - d. Respiratory paralysis followed by
  - e. Cardiac arrest
- Treatment of magnesium toxicity
  - a. Stop magnesium drip
  - b. Support respiratory effort

## KEY DOCUMENTATION ELEMENTS

- Document full vital signs and physical findings
- Document neurologic exam

## PERTINENT ASSESSMENT FINDINGS

- Vital signs assessment with repeat blood pressure monitoring before and after treatment
- Assessment of deep tendon reflexes after magnesium therapy
- Examination for end organ involvement

## QUALITY METRICS

- Patients with signs of hypertension and great than 20-weeks gestation or recent post-partum should be assess for signs of pre-eclampsia
- Recognition and appropriate treatment of eclampsia

# Newborn Care / Neonatal Resuscitation

## History

- Due date and gestational age
- Multiple gestation (twins, etc.)
- Meconium / Delivery difficulties
- Congenital disease
- Medications (maternal)
- Maternal risk factors such as substance abuse or smoking

## Signs and Symptoms

- Respiratory distress
- Peripheral cyanosis or mottling (normal)
- Central cyanosis (abnormal)
- Altered level of responsiveness
- Bradycardia

## Differential

- Airway failure
  - Secretions
  - Respiratory drive
- Infection
- Maternal medication effect
- Hypovolemia, hypoglycemia, hypothermia
- Congenital heart disease

## EMR & EMT-Basic

1. If immediate resuscitation is required and the newborn is still attached to the mother, clamp the cord in two places and cut between the clamps. If no resuscitation is required, warm / dry / stimulate the newborn and then cut / clamp the cord after 60 seconds or the cord stops pulsating.
2. Record APGAR scores at 1 and 5 minutes.
3. Warm, dry, and stimulate.
  - a. Wrap infant in dry towel or thermal blanket to keep infant as warm as possible during resuscitation; keep head covered if possible.
  - b. If strong cry, regular respiratory effort, good tone, and term gestation, infant should be placed skin-to-skin with mother and covered with dry linen.
4. If weak cry, signs of respiratory distress, poor tone, or preterm gestation then position airway (sniffing position) and clear airway as needed - if thick meconium or secretions present *and* signs of respiratory distress, suction mouth then nose.
5. If heart rate **greater than 100 beats** per minute.
  - a. Monitor for central cyanosis - provide blow-by oxygen as needed.
  - b. Monitor for signs of respiratory distress. If apneic or in significant respiratory distress:
    - i. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute.
6. If heart rate **less than 100 beats** per minute
  - a. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute.
    - i. Primary indicator of effective ventilation is improvement in heart rate.
    - ii. Rates and volumes of ventilation required can be variable, only use the minimum necessary rate and volume to achieve chest rise and a change in heart rate
  - b. If no improvement after 90 seconds, change oxygen delivery to 100% FiO2 until heart rate normalizes
7. If heart rate **less than 60 beats** per minute
  - a. Ensure effective ventilations with supplementary oxygen and adequate chest rise.
  - b. If no improvement after 30 seconds, initiate chest compressions - two-thumb-encircling-hands technique is preferred.
  - c. Coordinate chest compressions with positive pressure ventilation (3:1 ratio, 90 compressions and 30 breaths per minute).
8. Check a blood glucose for ongoing resuscitation, maternal history of diabetes, ill appearing or unable to feed.

Protocol Continues

# Newborn Care / Neonatal Resuscitation

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS Treatment**.
2. If heart rate **less than 60 beats** per minute despite ventilations and chest compressions:
  - a. Continue ventilations and chest compressions and consider advanced airway.
  - b. Administer **EPINEPHRINE (1:10,000) 0.01 mg/kg IV/IO** (preferable if access obtained) or 0.1 mg/kg via the ETT (if unable to obtain access).
3. Administer **NORMAL SALINE 20 mL/kg IV/IO** for signs of shock or post-resuscitative care.

APGAR Score			
Sign	0	1	2
Appearance	Blue, Pale	Body pink, Extremities blue	Completely pink
Pulse	Absent	< 100	> 100
Grimace	No response	Grimace	Cough or Sneeze
Activity	Limp	Some flexion	Active motion of extremities
Respirations	Absent	Slow, Irregular	Good, Crying

# Newborn Care / Neonatal Resuscitation

## PEARLS

- Newborn infants are prone to hypothermia which may lead to hypoglycemia, hypoxia and lethargy. Aggressive warming techniques should be initiated including drying, swaddling and warm blankets covering body and head.
- Raise temperature in ambulance patient compartment.
- Approximately 10% of newly born infants require some assistance to begin breathing.
- Deliveries complicated by maternal bleeding (placenta previa, vas previa, or placental abruption) place the infant at risk for hypovolemia secondary to blood loss.
- Low birth weight infants are at high risk for hypothermia due to heat loss.
- If pulse oximetry is used as an adjunct, the preferred placement of the probe is the right arm, preferably wrist or medial surface of the palm. Normalization of blood oxygen levels (SaO<sub>2</sub> 85-95%) will not be achieved until approximately 10 minutes following birth.
- Both hypoxia and excess oxygen administration can result in harm to the infant. If prolonged oxygen use is required, titrate to maintain an oxygen saturation of 85-95%.
- While not ideal, a larger facemask than indicated for patient size may be used to provide bag-valve-mask ventilation if an appropriately sized mask is not available - avoid pressure over the eyes as this may result in bradycardia.
- Increase in heart rate is the most reliable indicator of effective resuscitative efforts.
- A multiple gestation delivery may require additional resources and/or providers.
- During transport, neonate should be appropriately secured in seat or isolette and mother should be appropriately secured.

## KEY DOCUMENTATION ELEMENTS

- Document full vital signs and physical findings
- APGAR score
- Historical elements
  - Prenatal complications
  - Delivery complications
  - Date and time of birth
  - Estimated gestational age

## PERTINENT ASSESSMENT FINDINGS

- If there is any doubt as to viability, resuscitation efforts should be initiated
- Acrocyanosis, a blue discoloration of the distal extremities, is a common finding in the newly born infant transitioning to extrauterine life—this must be differentiated from central cyanosis

## QUALITY METRICS

- Time to initiation of interventions
- Use of oxygen during resuscitation
- Number of advanced airway attempts

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# Obstetric and Gynecological Conditions

## History

- Past medical history
- Hypertension medications
- Prenatal care
- Prior pregnancies / births
- Gravida / Para

## Signs and Symptoms

- Vaginal bleeding
- Abdominal pain
- Nausea / Vomiting
- Syncope
- Lightheadedness / Dizziness

## Differential

- Placenta previa
- Abruptio placenta
- Spontaneous abortion
- Ectopic pregnancy

## Definitions

**Abruptio placenta**: Occurs in third trimester of pregnancy; placenta prematurely separates from the uterus causing intrauterine bleeding

- a. Lower abdominal pain and uterine rigidity.
- b. Shock, with minimal or no vaginal bleeding.

**Placenta previa**: placenta covers part or all of the cervical opening

- a. Generally, late second or third trimester.
- b. Painless vaginal bleeding, unless in active labor.

**Ectopic pregnancy (ruptured)**

- a. First trimester.
- b. Abdominal/pelvic pain with or without minimal bleeding.

**Spontaneous abortion (miscarriage)**

- a. Generally first trimester.
- b. Intermittent pelvic pain (uterine contractions) with vaginal bleeding.

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Exam perineum.
3. Obtain history of pregnancy and pre-natal care.
4. Massage uterus if bleeding is post-delivery.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If signs of shock, refer to SHOCK Protocol.

## Paramedic

1. Continue **ILS TREATMENT**.
2. For hypotension and signs of shock due to significant, uncontrolled hemorrhage following delivery, consider **TRANEXAMIC ACID IV**.
  - **1 gram/10mL in 50mL NS over 10 minutes IV** via 10 drop tubing (1 drop per second).  
**\*According to the manufacturer, TXA should be given via a dedicated IV line.\***

# Obstetric and Gynecological Conditions

## PEARLS

- Patients in third trimester of pregnancy should be transported on left side or with uterus manually displaced to left if hypotensive.
- Do not place hand/fingers into vagina of bleeding patient except in cases of prolapsed cord or breech birth that is not progressing.
- Syncope can be a presenting symptom of hemorrhage from ectopic pregnancy or causes of vaginal bleeding.

## KEY DOCUMENTATION ELEMENTS

- Document full vital signs and physical findings

## PERTINENT ASSESSMENT FINDINGS

- Vital signs to assess for signs of shock (e.g. tachycardia, hypotension)
- Abdominal exam (e.g. distension, rigidity, guarding)

## QUALITY METRICS

- Recognition and appropriate treatment of shock
- Utilization of Tranexamic Acid

# Initial Trauma Care

## All Levels

### PRIMARY SURVEY:

#### Scene Size-Up

1. Ensure scene safety – identify any hazards.
2. Determine the number of patients.
3. Identify the mechanism of injury.
4. Call for additional resources if needed.

#### Initial Assessment

1. Obtain a general impression of the patient's condition.
2. Hemorrhage control
  - a. Assess for and stop severe hemorrhage. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
3. Airway
  - a. Assess airway patency by asking the patient to talk to assess for stridor and ease of air movement.
  - b. Establish patent airway with cervical spine precautions as needed, per the AIRWAY MANAGEMENT and SPINAL MOTION RESTRICTION Protocol.
  - c. Look for injuries that may lead to airway obstruction including unstable facial fractures, expanding neck hematoma, blood or vomitus in the airway, facial burns / inhalation injury.
  - d. Evaluate mental status for ability to protect airway (patients with GCS  $\leq$  8 are likely to require airway protection).
4. Breathing
  - a. Assess respiratory rate and pattern.
  - b. Assess symmetry of chest wall movement.
  - c. Listen bilaterally for breath sounds. If absent or diminished breath sounds in a hypotensive patient, consider tension pneumothorax and perform NEEDLE DECOMPRESSION (ILS/ALS ONLY)
  - d. For open chest wound, place occlusive dressing.
  - e. Monitor oxygen saturation and EtCO<sub>2</sub>, if indicated, provide supplemental **Oxygen**.
5. Circulation
  - a. Assess blood pressure and pulses noting rate, rhythm and quality.
  - b. Evaluate skin color, temperature and condition.
  - c. Establish IV access and administer **IV Fluid 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters**. **(ILS/ALS ONLY)**
  - d. In patients with head injury, hypotension should be avoided to maintain cerebral perfusion and target SBP should be 110-120 mmHg. **(ILS/ALS ONLY)**
6. Disability
  - a. Asses Level of Consciousness:  
**A** – Alert; **V** – Responds to verbal; **P** – Responds to pain; **U** – Unresponsive
7. Exposure
  - a. Rapid evaluation of entire body to identify sites of penetrating wounds or other blunt injuries. Be sure to roll patient and examine the back.
  - b. Prevent hypothermia (remove wet clothing and cover patient to prevent further heat loss).
8. **Critical Transport Decision** - Refer to REGION 6 TRAUMA TRIAGE ALGORITHM
  - a. Limit scene time to 10 minutes or less if the patient meets category A or B criteria.

Protocol Continues 

# Initial Trauma Care

## All Levels

### SECONDARY SURVEY:

#### **SAMPLE History**

- Signs and Symptoms
- Allergies
- Medications
- Past medical history, injuries, illnesses
- Last meal / intake
- Events leading up to the injury and/or illness

#### **Head to Toe Physical Exam**

*(Evaluate for: DCAP-BLS TIC—Deformities, Contusions, Abrasions, Puncture/Penetration/Paradoxical movement - Burns, Laceration, Swelling - Tenderness, Instability, Crepitus)*

1. Head
  - a. Palpate head, scalp and face and evaluate for soft tissue injury or bony crepitus.
  - b. Assess pupils.
2. Neck
  - a. Examine for contusions, abrasions, hematomas, lacerations, crepitus, JVD, or tracheal deviation.
  - b. Palpate the c-spine for deformity and tenderness. Refer to SPINAL MOTION RESTRICTION Protocol.
3. Chest
  - a. Palpate for instability / crepitus and look for flail segments or paradoxical movements.
  - b. Listen to breath sounds.
  - c. Inspect for penetrating or soft tissue injuries.
4. Abdomen
  - a. Palpate for tenderness.
  - b. Inspect for penetrating or soft tissue injuries.
5. Pelvis
  - a. Inspect for penetrating or soft tissue injuries.
  - b. Palpate once for instability by applying medial pressure on the iliac crests bilaterally.
6. Back
  - a. Maintain spinal alignment and log roll with a minimum of 2 rescuers.
  - b. Inspect for penetrating or soft tissue injuries.
  - c. Immobilize if applicable per the SPINAL MOTION RESTRICTION Protocol.
7. Neurologic status assessment
  - a. Calculate Glasgow Coma Scale (GCS).
  - b. Serial assessment of mental status.
  - c. Gross exam of motor, strength and sensation in all four extremities.
8. Extremities
  - a. Assess for fracture / deformity.
  - b. Assess peripheral pulses / capillary refill.

Protocol Continues 

# Initial Trauma Care

## All Levels

### ONGOING ASSESSMENT:

**Monitoring and Reassessment** (*seriously ill or injured patients should be reassessed every 5 min.*)

1. Reassess mental status (LOC, Pupils, GCS).
2. Reassess ABC's.
3. Reassess identified injuries (change in status, PMS).
4. Reassess and evaluate effectiveness of interventions.

### ADDITIONAL TREATMENT CONSIDERATIONS:

1. Maintain spine precautions per the SPINAL MOTION RESTRICTION Protocol.
2. Splint obvious extremity fractures per the EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
3. Provide pain medication per the PAIN MANAGEMENT Protocol.

GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Verbal	3
	To Pain	2
	None	1
Verbal Response	Oriented	5
	Confused	4
	Inappropriate Words	3
	Incomprehensible Sounds	2
	None	1
Best Motor Response	Obeys Commands	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain	3
	Extension to Pain	2
	None	1

# Initial Trauma Care

## PEARLS

- Optimal trauma care requires a structured approach to the patient emphasizing ABCDE (Airway, Breathing, Circulation, Disability, Exposure).
- Target scene time less than 10 minutes for unstable patients or those likely to need surgical intervention.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat neurologic status assessment.
  - a. If patient develops difficulty with ventilation, reassess breath sounds for development of tension pneumothorax.
  - b. If extremity hemorrhage is controlled with pressure dressing or tourniquet, reassess for evidence of continued hemorrhage.
  - c. If mental status declines, reassess ABCs and repeat neurologic status assessment.
  - d. Patients with compensated shock may not manifest hypotension until severe blood loss has occurred.
- Life-threatening injuries identified on primary survey should be managed immediately with rapid transport to a trauma center, while the secondary survey is performed enroute.
- Patients with traumatic brain injury may deteriorate as intracranial swelling and hemorrhage increase.
- Anticipate potential for progressive airway compromise in patients with trauma to head and neck.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and neurologic assessments
- Scene time
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Primary Survey
- Secondary Survey
- Ongoing Assessment

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center

# Region 6 Trauma Triage Algorithm

## Region 6 Trauma Triage Algorithm

When in doubt, take patient to an appropriate Trauma Center.

Measure signs and level of consciousness and assess for major injury.

For Patients Meeting Category A or B Criteria: Initiate Rapid Transport with Maximum of 10 Minute Scene Time

Airway Compromise or Management by a Basic Level EMS Provider without Mutual Aid Should be Transported to the Nearest Facility

### Category A:

- GCS Less than or equal to 10
- Systolic BP less than 90 (Adult), 80 (Peds) with mechanism or exam findings suggesting ongoing blood loss
- Paralysis (spine)
- Uncontrolled Bleeding
- Penetrating injuries to abdomen, back, chest or neck and suspicion of significant injury
- Burns >24% surface area, or involving face/airway not meeting other Category A criteria (Direct to Burn Center)
- Salvageable amputation proximal to wrist or ankle not meeting other Category A criteria (Direct To Reimplant Center)
- Unstable Pelvic Fracture
- Pulseless Extremity
- Cardiac Tamponade or Tension Pneumothorax

YES

#### STRONGLY RECOMMEND:

Transport to Level I Trauma Center or Specialty Center per Protocol

Alert Trauma Team; Consider Helicopter Transport if Quicker and of Clinical Benefit.

NO:

Assess for other injuries.

### Category B:

- LOC greater than 5 minutes and GCS 11-12
- Respiratory rate less than 10 or greater than 29
- Head injury with seizure activity, unilaterally dilated pupil or open/depressed skull fracture
- Full arrest not meeting Field Death Criteria
- Penetrating injuries with capability to work up/correct

#### High Risk Vehicular Crash:

- \*Rollover with unbelted passengers
- \*Ejection from crash
- \*Death in same passenger compartment
- \*Auto v. pedestrian/bicyclist thrown or run over
- \*Motorcycle crash with separation of rider and bike.
- Falls greater than 20 ft or 2-3 times patient's height if child
- Flail Chest/Chest wall instability
- Two or more proximal long bone fractures

YES

#### STRONGLY RECOMMEND:

Transport to center capable of providing definitive care (surgery if needed); alert trauma team; consider helicopter transport if quicker and of clinical benefit.

NO

Transport According to Trauma Protocols

# Region 6 Trauma Triage Algorithm

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**Adult Trauma**



# Abdominal Injuries

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Bleeding
- Evidence for multi-trauma
- Past medical history
- Medications

## Signs and Symptoms

- Pain
- Nausea / Vomiting
- Bruising and/or bleeding
- Distention
- Evisceration
- Altered mental status or unconscious
- Hypotension or shock
- Arrest

## Differential

- Blunt vs penetrating trauma
- Intra-abdominal bleeding
- Evisceration
- Pelvis / Femur fracture

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Control bleeding.
3. Treat any obvious abdominal injuries as indicated:
  - a. **Evisceration:** Cover the organs with a saline-soaked sterile dressing. Do not attempt to put the organs back into the abdomen.
  - b. **Impaled Objects:** Stabilize object with a bulky dressing. Do not attempt to remove an impaled object.
  - c. **Penetrating Wounds:** Cover with saline-soaked sterile dressing. Look for potential exit wounds.
  - d. **Blunt Trauma:** Continue to assess for clinical change (pain, distension, bruising, etc.)
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **IV Fluid 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90 mmHg; maximum 2 liters.
4. Consider management of pain per the PAIN MANAGEMENT Protocol.
5. Consider management of nausea/vomiting per the NAUSEA / VOMITING Protocol.

# Abdominal Injuries

## PEARLS

- Trauma to the abdomen is either blunt or penetrating.
- Blunt injuries are harder to detect and diagnose and have a higher mortality rate.
- Key signs and symptoms of blunt trauma include a patient in shock with no obvious injuries.
- Distention of the abdomen is an indication of internal hemorrhage. (Pain may not be a significant factor)
- Many abdominal trauma injuries are Load & Go cases.
- Target scene time less than 10 minutes.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat abdominal exams.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and abdominal assessments
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Repeat abdominal exams
- Evaluate for exit wounds with penetrating injuries

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center

# Blast Injuries

## History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

## Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension / Shock
- Airway compromise / Respiratory distress

## Differential

- Superficial (1<sup>st</sup> Degree) red and painful
- Partial Thickness (2<sup>nd</sup> Degree) blisters
- Full Thickness (3<sup>rd</sup> Degree) painless/charred or leathery skin
- Thermal injury
- Chemical injury
- Electrical injury
- Radiation injury

## All Levels

1. Hemorrhage control
  - a. Assess for and stop severe hemorrhage. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
2. Airway
  - a. Assess airway patency and consider possible thermal or chemical airway burns.
  - b. Establish patent airway with cervical spine precautions per the AIRWAY MANAGEMENT and SPINAL MOTION RESTRICTION Protocol.
  - c. If thermal or chemical burns to airway are suspected, early airway control is vital.
3. Breathing
  - a. Evaluate adequacy of respiratory effort, oxygenation, quality of lung sounds and chest wall integrity.
  - b. Listen bilaterally for breath sounds. Consider possible pneumothorax or tension pneumothorax (as a result of penetrating / blunt trauma or barotrauma).
  - c. If absent or diminished breath sounds in a hypotensive patient, consider tension pneumothorax and perform NEEDLE DECOMPRESSION (ILS/ALS ONLY)
  - d. For open chest wound, place occlusive dressing.
  - e. Monitor oxygen saturation and EtCO<sub>2</sub>. If indicated, provide supplemental **Oxygen**.
4. Circulation
  - a. Assess blood pressure and pulses noting rate, rhythm and quality.
  - b. Assess skin color, temperature and condition.
  - c. Establish IV access and administer **IV Fluid 500 mL bolus** to maintain SBP ≥ 90 mmHg or MAP ≥ 65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP ≥ 90mmHg or MAP ≥ 65 mmHg; maximum **2 liters**. **(ILS/ALS ONLY)**
  - d. In patients with head injury, hypotension should be avoided to maintain cerebral perfusion and target SBP should be 110-120 mmHg. **(ILS/ALS ONLY)**
5. Disability
  - a. Assess level of consciousness (AVPU).
  - b. If evidence of head injury, treat per the HEAD INJURY Protocol.
  - c. Apply spinal precautions, per the SPINAL MOTION RESTRICTION Protocol.
6. Exposure
  - a. Rapid evaluation of entire body to identify sites of penetrating wounds, blunt injuries or burns. Be sure to roll patient and examine the back.
  - b. Keep patient warm to prevent hypothermia.
  - c. If patient has burns, refer to BURNS Protocol.

# Blast Injuries

## PEARLS

- Ensuring scene safety is especially important at the scene of an explosion.
  - a. Consider possibility of subsequent explosions, structural safety, possible toxic chemical contamination, the presence of noxious gasses, and other hazards.
  - b. In a possible terrorist event, consider the possibility of secondary explosive devices
- Remove patient from the scene as soon as is practical and safe.
- Patients sustaining blast injury may sustain complex, multi-system injuries including: blunt and penetrating trauma, shrapnel, barotrauma, burns, and toxic chemical exposure.
- Consideration of airway injury, particularly airway burns, should prompt early and aggressive airway management.
- Minimize IV fluid resuscitation in patients without signs of shock.
- Consider injuries due to barotrauma:
  - a. Tension pneumothorax
    - i. Hypotension or other signs of shock associated with decreased or absent breath sounds, jugular venous distension, and/or tracheal deviation.
  - b. Tympanic membrane perforation resulting in deafness which may complicate the evaluation of their mental status and their ability to follow commands.
- **Types of Blast Injury:**
  - a. Primary Blast Injury: From pressure wave.
  - b. Secondary Blast Injury: Impaled objects. Debris which becomes missiles / shrapnel. (Most common cause of death)
  - c. Tertiary Blast Injury: Patient falling or being thrown / pinned by debris.

## KEY DOCUMENTATION ELEMENTS

- Airway status and intervention
- Breathing status (Oxygenation, respiratory effort)
- Documentation of burns, including TBSA
- Documentation of possible toxic chemical contamination

## PERTINENT ASSESSMENT FINDINGS

- Evidence of multi-system trauma, especially:
  - a. Airway injury / burn
  - b. Barotrauma to lungs
  - c. Toxic chemical contamination

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Airway assessment and early and aggressive management

# Burns

## (Thermal, Chemical, Electrical, Inhalation)

### History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

### Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension / Shock
- Airway compromise / distress
- Singed facial or nasal hair
- Hoarseness / Wheezing

### Differential

- Superficial (1<sup>st</sup> Degree) red and painful
- Partial Thickness (2<sup>nd</sup> Degree) blisters
- Full Thickness (3<sup>rd</sup> Degree) painless/charred or leathery skin
- Thermal burns
- Chemical burns
- Electrical burns
- Radiation injury

## EMR & EMT-Basic

### General Treatment:

1. Assure scene and rescuer safety.
2. **INITIAL TRAUMA CARE.**
3. Expose the burned area and remove any rings, bracelets or other constricting items.
4. Estimate Total Body Surface Area (TBSA) and depth of burn.
  - a. Use "Rule of 9's".
  - b. First-degree (superficial) burns (skin erythema only) are not included in TBSA calculations.
5. If evidence of possible airway burn (burns around face, nares or pharynx), consider aggressive airway management per the AIRWAY MANAGEMENT Protocol.
6. Evaluate distal circulation in circumferentially burned extremities.
7. Prevent systemic heat loss and keep the patient warm.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

### Thermal Burns:

1. Stop the burning process with sterile water or normal saline.
  - a. Remove non-adherent clothing and jewelry.
  - b. Leave blisters intact.
2. Minimize burn wound contamination.
  - a. Cover burns with dry dressing or clean sheet.
  - b. Do not apply gels or ointments.
3. Consider Carbon Monoxide and/or Cyanide poisoning in patients with smoke inhalation. Refer to CARBON MONOXIDE / SMOKE INHALATION and CYANIDE POISONING Protocols.

### Chemical Burns:

1. If dry chemical contamination, carefully brush off solid chemical prior to flushing the site.
2. If wet chemical contamination, flush the patient's skin (and eyes, if involved) with copious amounts of water or normal saline.
3. For eye exposure, administer continuous flushing of Normal Saline fluid to eye.

### Electrical Burns:

1. Verify scene safety and ensure that the electrical source is disabled prior to assessment.
2. Assess for visible entrance and exit wounds and treat as thermal burns.
3. Immobilize if associated trauma suspected. Refer to SPINAL MOTION RESTRICTION Protocol.
4. Determine characteristics - AC or DC, voltage, amperage, time of injury.

Protocol Continues 

# Burns

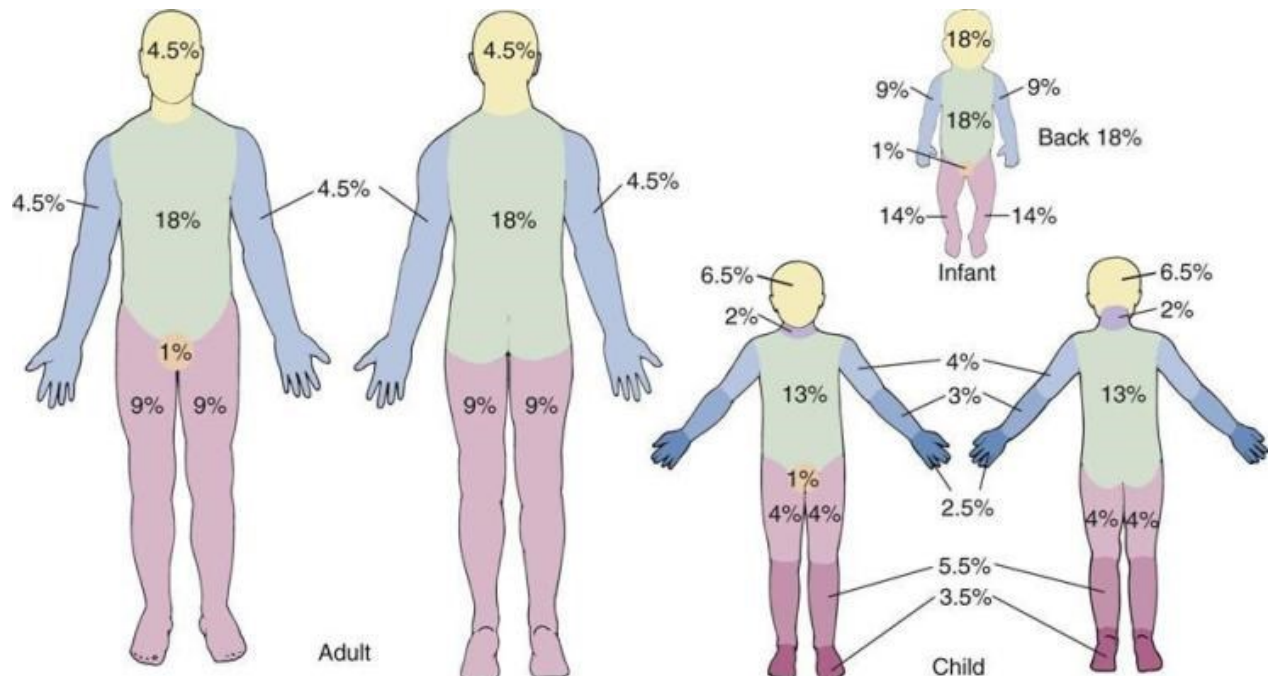
## (Thermal, Chemical, Electrical, Inhalation)

### EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Apply cardiac monitor and assess for dysrhythmias, especially in electrical injuries.
3. Establish IV access. Avoid placement through burned skin.
4. Administer **IV Fluid 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters**.
5. Consider the need for an advanced airway if signs of inhalation injury (burns around face, nares or pharynx) are present per the AIRWAY MANAGEMENT Protocol.
6. Consider early management of pain per the PAIN MANAGEMENT Protocol.

### Rule of Nine's

**% Partial Thickness + % Full Thickness = % Total Burn Surface Area (TBSA)**



# Burns

## (Thermal, Chemical, Electrical, Inhalation)

### PEARLS

- Onset of stridor and change in voice are sentinel signs of potentially significant airway burns, which may rapidly lead to airway obstruction or respiratory failure. Early intubation is required in significant inhalation injuries.
- EtCO<sub>2</sub> monitoring may be particularly useful to monitor respiratory status in patients receiving significant doses of narcotic pain medication.
- Particularly in enclosed-space fires, carbon monoxide toxicity is a consideration and pulse oximetry may not be accurate.
- Cardiac monitor is important in electrical burns and chemical inhalations.
- Have a high index of suspicion for cyanide poisoning in a patient with depressed GCS, respiratory difficulty and cardiovascular collapse in the setting of an enclosed-space fire. Give the antidote (hydroxocobalamin), if available, in this circumstance.
- Pain management is critical in acute burns.
- TBSA is calculated only based on percent of second (partial thickness) and third degree (full thickness) burns – First degree (superficial) burns are not included in this calculation.
- Burn patients are prone to hypothermia—never apply ice or cool burns that involve > 10% TBSA.
- Burn patients are trauma patients; evaluate for multisystem trauma.
- Anticipate atrial and/or ventricular dysrhythmias as well as cardiac arrest with electrical injuries.
- The mortality related to electrical injuries is impacted by several factors:
  - a. Route current takes through the body – current traversing the heart has higher mortality.
  - b. Type of current – AC vs. DC
    - i. AC is more likely to cause cardiac dysrhythmias while DC is more likely to cause deep tissue burns however either type of current can cause any injury.
    - ii. DC typically causes one muscle contraction while AC can cause repeated contractions.
    - iii. Both types of current can cause involuntary muscle contractions that do not allow the victim to let go of the electrical source.
    - iv. AC is more likely to cause ventricular fibrillation while DC is more likely to cause asystole.
- For chemical burns: Normal Saline or Sterile Water is preferred, however if not available, do not delay irrigation and use tap water. Other water sources may be used based on availability. Flush the area as soon as possible with the cleanest readily available water or saline solution using copious amounts of fluids.

### KEY DOCUMENTATION ELEMENTS

- Initial airway status
- Total volume of fluid administered
- TBSA of second and third degree burns
- Pulse and capillary refill exam distally on any circumferentially burned extremity
- Pain management

### PERTINENT ASSESSMENT FINDINGS

- Consider related trauma in addition to burns
- Consider inhalation exposures such as CO and CN
- If evidence of possible airway burn, consider aggressive airway management
- Estimate TBSA burned and depth of burn

### QUALITY METRICS

- Patient transported to most appropriate hospital
- Pain appropriately managed
- Airway assessment and early and aggressive management, especially with burns to face, nares or pharynx

# Burns

**(Thermal, Chemical, Electrical, Inhalation)**

**Intentionally Left  
Blank**



# Chest Injuries

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Bleeding
- Evidence for multi-trauma
- Past medical history
- Medications

## Signs and Symptoms

- Shortness of breath / Dyspnea
- Chest pain
- Cyanosis
- Absent / Diminished breath sounds
- Hypotension / Shock
- Paradoxical chest wall movement
- Bruising over sternum

## Differential

- Simple pneumothorax
- Tension pneumothorax
- Flail chest
- Open chest wound
- Hemothorax
- Traumatic asphyxia
- Cardiac tamponade

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Control bleeding.
3. Treat any obvious chest injuries as indicated:
  - a. **Open Chest Wound:** Apply occlusive dressing, leaving one side / corner open. Monitor for tension pneumothorax.
  - b. **Impaled Objects:** Stabilize object with a bulky dressing. Do not attempt to remove an impaled object.
  - c. **Flail Chest:** Stabilize with a bulky dressing.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access and administer **IV Fluid 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters**.
3. Treat any obvious chest injuries as indicated (including above):
  - a. **Tension Pneumothorax:** Perform NEEDLE DECOMPRESSION.
    - i. Signs and symptoms: Hypotension or other signs of shock associated with decreased or absent breath sounds, JVD and/or tracheal deviation.
  - b. **Flail Chest:** For massive flail chest with severe respiratory compromise, consider advanced airway per the AIRWAY MANAGEMENT Protocol.
4. Apply cardiac monitor and perform 12-lead ECG.
5. Consider management of pain per the PAIN MANAGEMENT Protocol.

# Chest Injuries

## PEARLS

- Chest pain due to blunt trauma may be an indication of underlying injury.
- Blunt injuries such as pulmonary contusion and cardiac contusion may cause respiratory insufficiency and/or myocardial infarction. Acquire and transmit 12-lead ECG.
- If tension pneumothorax develops in a patient with a sealed sucking chest wound, attempt to resolve by releasing air from the seal prior to decompressing chest.
- Chest decompression is only indicated for a true tension pneumothorax. It is not appropriate to needle decompress a simple pneumothorax.
- Target scene time less than 10 minutes.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat neurologic status assessment.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and neurologic assessments
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Signs and symptoms of tension pneumothorax
- Airway and respiratory assessment
- Consider underlying cardiac injury and apply cardiac monitor

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Airway assessment and management appropriately documented

# Conducted Electrical Weapon Injury (Taser®)

## History

- Time of injury
- Bleeding
- Evidence for multi-trauma
- Past medical history
- Cardiac history
- Psychiatric history

## Signs and Symptoms

- External signs of trauma
- Palpitations
- Intoxication / Substance Abuse

## Differential

- Excited Delirium
- Traumatic injury
- Closed head injury
- Cardiac dysrhythmia

## All Levels

1. **INITIAL TRAUMA CARE.**
2. Ensure Scene Safety prior to providing patient care.
  - a. Make sure patient is appropriately secured with assistance of law enforcement to protect the patient and staff.
  - b. Consider psychologic management medications if patient is struggling against physical devices and may harm themselves or other. Refer to [BEHAVIORIAL EMERGENCIES](#) Protocol.
3. Confirm device has been turned off and that the barb cartridge has been disconnected from the electrical weapon.
4. Obtain vital signs and cardiac monitoring. Consider 12-lead ECG (if available for BLS).
5. Patients with conducted electrical weapon (Taser®) barb penetration in vulnerable areas of body as mentioned below should be transported to the hospital for further evaluation and probe removal.
  - a. Barbs embedded in skin above level of the clavicles, genitalia or female breasts.
  - b. Suspicion that probe might be embedded in bone, blood vessel or other sensitive structure.
6. Barb(s) can be removed if **NOT** in a vulnerable area listed above, by stabilizing the skin surrounding the barb and grasping the barb shaft and pulling straight out with a gentle but quick motion.
  - a. Once extracted, visually inspect barb to make sure it is intact and that nothing remains in patient.
7. Document the removal location and time of removal in the patient care report.
8. Apply bandage to the area where the barb was removed.
9. Inform the patient that they will need a tetanus shot if they have not received one in the last five years.
10. Transport patient to the hospital if barbs cannot be safely removed in the field or if in a vulnerable area listed above.

# Conducted Electrical Weapon Injury (Taser®)

## PEARLS

- Before removal of the barbed dart, make sure the cartridge has been removed from the conducted electrical weapon.
- Patient should not be restrained in the prone, face down, or hog-tied position as respiratory compromise is a significant risk.
- The patient may have underlying pathology before being tased (refer to appropriate guidelines for managing the underlying medical/traumatic pathology).
- Perform a comprehensive assessment with special attention looking for signs and symptoms that may indicate excited delirium.
- Transport the patient to the hospital if they have concerning signs or symptoms.
- EMS providers who respond for a conducted electrical weapon patient should not perform a “medical clearance” for law enforcement.
- Conducted electrical weapon can be discharged in three fashions:
  - a. Direct contact without the use of the darts
  - b. A single dart with additional contact by direct contact of weapon
  - c. From a distance up to 35 feet with two darts
- The device delivers 19 pulses per second with an average current per pulse of 2.1 milliamps which in combination with toxins/drugs, patient’s underlying diseases, excessive physical exertion, and trauma may precipitate arrhythmias, thus consider ECG monitoring and 12-lead ECG assessment.
- Drive Stun is a direct two-point contact weapon which is designed to generate pain and not incapacitate the subject. Only local muscle groups are stimulated with the Drive Stun technique.

## KEY DOCUMENTATION ELEMENTS

- If darts removed, document the removal location in the patient care report
- Physical exam trauma findings
- Cardiac rhythm and changes
- Neurologic status assessment findings

## PERTINENT ASSESSMENT FINDINGS

- Thoroughly assess the patient for trauma as the patient may have fallen
- Ascertain if more than one taser cartridge was used

## QUALITY METRICS

- Abnormal findings or vital signs were addressed
- Patient received ECG or 12-lead ECG evaluation

# Crush Injuries

## History

- Entrapped and crushed under heavy load > 60 minutes
- Extremity / body crushed
- Building collapse, trench collapse, industrial accident, pinned under heavy equipment

## Signs and Symptoms

- Hypotension / Shock
- Altered mental status
- **Compartment Syndrome:**
  - Pain
  - Paresthesia
  - Paralysis
  - Pallor
  - Pulselessness
  - Poikilothermia (cool to touch)

## Differential

- Entrapment without crush syndrome
- Vascular injury with perfusion deficit
- Compartment syndrome
- Altered mental status

## EMR & EMT-Basic

1. Ensure scene and rescuer safety.
2. **INITIAL TRAUMA CARE.**
3. Place approved tourniquet on the affected extremity (-ies) just proximal, but as close as possible to the crushed area.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish 2 large bore IVs (not in the injured extremity).
3. Treat pain based on PAIN MANAGEMENT Protocol.
4. Administer **NORMAL SALINE 1,000 mL** bolus prior to release of crushed extremity. Continue **NORMAL SALINE 500 mL/hr**.
  - a. Use with caution in patient with history of CHF. STOP fluids if signs of pulmonary edema (increasing shortness of breath or rales/crackles on lung exam).
5. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.
2. Initiate cardiac monitoring and assess for hyperkalemia (Wide QRS, Peaked T waved or flattened / absent P waves). Acquire and transmit 12-lead ECG.
3. Administer **SODIUM BICARBONATE** for significant crush injuries or prolonged entrapment of an extremity:
  - a. Mix **50 mEq in 1000 mL** of 0.9% Normal Saline. Administer the entire 1000 mL bolus PRIOR to release of crushed extremity.
  - b. STOP fluids if signs of pulmonary edema (increasing shortness of breath or rales/crackles on lung exam).
4. Lift object **SLOWLY** off of the patient.
5. Continue **NORMAL SALINE 500 mL/hr**.
6. Transport to appropriate Trauma Facility.

# Crush Injuries

## PEARLS

- A patient with a crush injury may initially present with very few signs and symptoms. Therefore, maintain a high index of suspicion for any patient with a compressive mechanism of injury.
- A fatal medical complication of crush syndrome is hyperkalemia. Suspect hyperkalemia if T-waves become peaked, QRS becomes prolonged (greater than 0.12 seconds), absent P wave, or prolonged QTc.
- Avoid Lactated Ringer's solution as it contains potassium.
- Continue fluid resuscitation through extrication and transfer to hospital.
- Patient may become hypothermic even in warm environments.

## KEY DOCUMENTATION ELEMENTS

- Time of tourniquet application, if applied
- Neurovascular status of any crushed extremity
- ECG findings consistent with hyperkalemia
- Amount of IV fluid administered

## PERTINENT ASSESSMENT FINDINGS

- Monitor for development of compartment syndrome
- Mental status / GCS
- Evidence of additional trauma, potentially masked by other painful injuries

## QUALITY METRICS

- Initiation of fluid resuscitation prior to extrication
- ECG / monitor to monitor for dysrhythmias or changes related to hyperkalemia
- Appropriate transport of trauma patients to Trauma Center

# Extremity Trauma / External Hemorrhage Management

## History

- Type of injury
- Mechanism: crush / penetrating / amputation
- Time of injury
- Open vs. closed wound / fracture
- Wound contamination
- Medical history (Tetanus history)
- Medications

## Signs and Symptoms

- Pain, swelling
- Deformity
- Altered sensation / Motor function
- Diminished pulse / Capillary refill
- Decreased extremity temperature

## Differential

- Abrasion
- Contusion
- Laceration
- Sprain
- Dislocation
- Fracture
- Amputation

## All Levels

1. **INITIAL TRAUMA CARE.**
2. Manage bleeding.
  - a. Apply direct pressure to bleeding site followed by pressure dressing.
  - b. If direct pressure / pressure dressing is ineffective or impractical:
    - i. Apply TOURNIQUET to extremity if the bleeding site is amenable to tourniquet placement.
      1. Tourniquet should be placed 2-3 inches proximal to wound, not over a joint or fracture, and tightened until bleeding stops and distal pulse is eliminated.
      2. If bleeding continues, place a second tourniquet proximal to the first.
      3. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially to eliminate distal pulse.
      4. Document time of application and location of tourniquet and ensure that receiving facility is aware of time of placement.
    - ii. If the bleeding site is not amenable to tourniquet placement (i.e. groin, axillary, trunk, head, etc.), pack wound tightly with HEMOSTATIC GAUZE and apply direct pressure.
      1. Consider using a JUNCTIONAL HEMOSTATIC DEVICE if available.
3. Manage pain.
  - a. Refer to PAIN MANAGEMENT Protocol.
  - b. Pain management should be strongly considered for patients with suspected fractures.
  - c. If tourniquet is placed, an alert patient will likely require pain medication to manage pain.
4. Stabilize suspected fractures / dislocations.
  - a. Strongly consider pain management before attempting to move a suspected fracture.
  - b. If distal vascular function is compromised, gently attempt to restore normal anatomic position.
  - c. Use splints as appropriate to limit movement of suspected fracture.
  - d. Elevate extremity fractures above heart level whenever possible to limit swelling.
  - e. Apply ice packs to limit swelling in suspected fractures or soft tissue injury (DO NOT apply ice directly to skin).
  - f. Reassess distal neurovascular status after any manipulation or splinting of fractures / dislocations.
5. Amputations
  - a. Rinse amputated part gently with normal saline if gross contamination.
  - b. Wrap part in moist sterile gauze and place in water tight plastic bag and seal.
  - c. Place sealed bag on ice. **(DO NOT place tissue directly on ice).**

# Extremity Trauma / External Hemorrhage Management

## PEARLS

- If tourniquet use:
  - a. Ensure that it is sufficiently tight to occlude the distal pulse, in order to avoid compartment syndrome.
  - b. Ensure that it is well marked and visible and that all subsequent providers are aware of the presence of the tourniquet.
  - c. DO NOT cover with clothing or dressings.
  - d. Mark time of tourniquet placement prominently on the patient.
- If pressure dressing or tourniquet used, frequently re-check to determine if bleeding has restarted. Check for blood soaking through the dressing or continued bleeding distal to the tourniquet. Do not remove tourniquet or dressing in order to assess bleeding.
- Survival is markedly improved when a tourniquet is placed *before* shock ensues.
- Commercial / properly tested tourniquets are preferred over improvised tourniquets.
- If hemostatic gauze is not available, plain gauze packed into a wound has been shown to be effective.
- DO NOT take time to splint injured extremities in major trauma patients unless it does not delay the scene time or if it prevents you from performing more pertinent patient care.
- Splint the joint above and below for all suspected fractures.
- Splint the bone above and below for all suspected joint injuries.
- Hip dislocations and knee and elbow fracture / dislocations have a high incidence of vascular compromise.
- Urgently transport any injury with vascular compromise.
- DO NOT manipulate pelvis once fracture is suspected. Repeated manipulation can increase internal hemorrhage.

## KEY DOCUMENTATION ELEMENTS

- Vital signs and vascular status of extremity after placement of tourniquet, pressure dressing, or splint
- Documentation of elimination of distal pulse after tourniquet placement
- Time of tourniquet placement

## PERTINENT ASSESSMENT FINDINGS

- Evaluate for obvious deformity, shortening, rotation, or instability
- Neurologic status of extremity
  - a. Sensation to light touch
  - b. Distal movement of extremity
- Vascular status of extremity
  - a. Pallor
  - b. Pulse
  - c. Capillary refill
  - d. Degree of bleeding / blood loss with assessment of the color of the blood (venous or arterial) and whether it is pulsatile or not

## QUALITY METRICS

- Proper placement of tourniquet (location, elimination of distal pulse)
- Proper marking and timing of tourniquet placement and notification of subsequent providers of tourniquet placement
- Appropriate splinting of fractures
- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center



# Head Injury

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Loss of consciousness
- Bleeding
- Past medical history
- Medications
- Evidence for multi-trauma
- Helmet use or damage to helmet

## Signs and Symptoms

- Pain, swelling, bleeding
- Altered mental status
- Unconscious
- Respiratory distress / failure
- Vomiting
- Major traumatic mechanism of injury
- Seizure

## Differential

- Skull fracture
- Brain injury (concussion, contusion, hemorrhage or laceration)
- Epidural hematoma
- Subdural hematoma
- Subarachnoid hemorrhage
- Spinal injury
- Abuse

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Maintain cervical stabilization per the SPINAL MOTION RESTRICTION Protocol.
3. Airway:
  - a. If patient unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury or possible basilar skull fracture).
4. Breathing:
  - a. Administer **Oxygen** as appropriate with a target of achieving 94-98% saturation.
5. Circulation:
  - a. Wound care
    - i. Control bleeding with direct pressure if no suspected open skull injury.
    - ii. Moist sterile dressing to any potential open skull wound.
6. Disability:
  - a. Evaluate for other causes of altered mental status—check blood glucose.
  - b. Spinal assessment and management per SPINAL MOTION RESTRICTION Protocol.
  - c. Perform and trend neurologic status assessment (moderate / severe: GCS 3-13, P or U on AVPU)
    - i. Early signs of deterioration: Confusion, Agitation, Drowsiness, Vomiting, Severe Headache.
    - ii. Monitor for signs of herniation.
7. Treat specific facial injuries as indicated:
  - a. **Unstable Mandible:** Have suction readily available as patient may not be able to spit / swallow effectively. Preferably transport patient sitting upright if no suspected spinal injury.
  - b. **Eye Trauma:** Place eye shield for any significant eye trauma (if available). If globe is avulsed, cover with moist saline dressing.
  - c. **Avulsed Tooth:** Avoid touching the root of the avulsed tooth. Do not wipe off tooth. Pick up at crown end and rinse off with cold water, if dirty. Place in milk or saline as the storage medium.
  - d. **Epistaxis:** Squeeze nose for 10-15 minutes continuously.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

Protocol Continues 

# Head Injury

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. For patients with moderate / severe head injury:
  - a. If unable to maintain their airway, use continuous waveform capnography and EtCO<sub>2</sub> measurement, with a target EtCO<sub>2</sub> of 35-40 mmHg.
  - b. Administer **IV Fluid 500 mL bolus** to maintain SBP ≥ 110 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP ≥ 110mmHg; maximum **2 liters**. Hypotension should be avoided to maintain cerebral perfusion and target SBP should be 110-120 mmHg.
3. For patients with a severe head injury with signs of herniation that are unconscious or semi-conscious:
  - a. Manage airway according to the AIRWAY MANAGEMENT Protocol; hyperventilate to a target EtCO<sub>2</sub> of 30-35 mmHg as a short-term option.

GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Verbal	3
	To Pain	2
	None	1
Verbal Response	Oriented	5
	Confused	4
	Inappropriate Words	3
	Incomprehensible Sounds	2
	None	1
Best Motor Response	Obeys Commands	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain	3
	Extension to Pain	2
	None	1

# Head Injury

## PEARLS

- Head injury severity guideline:
  - a. Mild: GCS 13-15 / AVPU = (A)
  - b. Moderate: GCS 9-12 / AVPU = (V)
  - c. Severe: GCS 3-8 / AVPU = (P) or (U)
- The most important item to monitor and document is a change in the level of consciousness.
- If endotracheal intubation or invasive airways are used, continuous waveform capnography is required to document proper tube placement and assure proper ventilation rate.
- Signs of herniation:
  - a. Decreasing mental status
  - b. Abnormal respiratory pattern
  - c. Asymmetric / unreactive pupils
  - d. Decorticate posturing
  - e. Cushing's response (bradycardia and hypertension)
  - f. Decerebrate posturing
- DO NOT hyperventilate patient unless signs of herniation are present.
- Assume concomitant cervical spine injury in patients with moderate / severe head injury.

## KEY DOCUMENTATION ELEMENTS

- Adequate oxygenation
- Airway status and management
- EtCO<sub>2</sub> monitored and documented for moderate / severe head injury (avoidance of inappropriate hyperventilation)
- Neurological and mental status assessment

## PERTINENT ASSESSMENT FINDINGS

- Neurologic status assessment findings
- Pupils
- Trauma findings on physical exam

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center

# Head Injury

**Intentionally Left  
Blank**

**Adult Trauma**

# Spinal Motion Restriction

**Spinal Motion Restriction** is defined as application of a cervical collar and maintenance of the spine in neutral alignment (long backboard, a scoop stretcher, a vacuum mattress, or an ambulance cot).

Determination of spinal motion restriction should be made by the highest level EMS provider.

## All Levels

1. **Spinal Motion Restriction** is **required** when ANY of the following conditions apply following blunt trauma: *(When in doubt, apply spinal motion restriction)*.
  - a. **Acutely altered level of consciousness** (e.g., GCS <15, evidence of intoxication)
  - b. **Midline neck or back pain and/or tenderness.**
  - c. **Focal neurologic signs and/or symptoms** (e.g., numbness or motor weakness).
  - d. **Anatomic deformity of the spine.**
  - e. **Distracting circumstances or injury** (e.g., long bone fracture, degloving, or crush injuries, large burns, etc.) or any similar injury that impairs the patient's ability to contribute to a reliable examination.
  - f. **Torticollis** (patient is unable to move neck from "abnormal position" to "normal position").
  - g. **Communication barrier** (emotional / language / cognitive impairment)
2. Spinal Motion Restriction is **NOT** utilized in penetrating trauma to the head and/or neck without evidence of spinal injury.
3. Patient's should be allowed to self extricate, if able, from a vehicle after placing a cervical collar, if indicated.
4. Once the backboarded patient is placed on ambulance cot, remove backboard by using a log roll technique, minimizing unnecessary movement during the removal process. Maintain Spinal Motion Restriction by assuring that the patient remains securely positioned on the cot with a cervical collar in place.
5. Helmet removal:
  - a. If a football helmet needs to be removed, it is recommended to remove the face mask followed by manual removal (rather than the use of automated devices) of the helmet while keeping the neck manually immobilized - occipital and shoulder padding should be applied, as needed, with the patient in a supine position, in order to maintain neutral cervical spine positioning.

Peter E. Fischer, Debra G. Perina, Theodore R. Delbridge, Mary E. Fallat, Jeffrey P. Salomone, Jimm Dodd, Eileen M. Bulger & Mark L. Gestring (2018): Spinal Motion Restriction in the Trauma Patient – A Joint Position Statement, Prehospital Emergency Care, DOI: 10.1080/10903127.2018.1481476

# Spinal Motion Restriction

## PEARLS

- Be aware of potential airway compromise or aspiration in immobilized patient with nausea / vomiting, or with facial / oral bleeding.
- Excessively tight immobilization straps can limit chest excursion and cause hypoventilation.
- Prolonged immobilization on spine board can lead to ischemic pressure injuries to skin.
- Prolonged immobilization on spine board can be very uncomfortable for patient.
- In an uncooperative patient, avoid interventions that may promote increased spinal movement.
- The preferred position for all patients with spine management is flat and supine. There are three circumstances under which raising the head of the bed to 30 degrees should be considered:
  - a. Respiratory distress
  - b. Suspected severe head trauma
  - c. Promotion of patient compliance
- Age alone should not be a factor in decision-making for prehospital spine care, yet the patient's ability to reliably be assessed at the extremes of age should be considered. Communication barriers with infants/ toddlers or elderly patients with dementia may prevent the provider from accurately assessing the patient.
- Spinal precautions should be considered a treatment or preventive therapy.
- Patients who are likely to benefit from immobilization should undergo this treatment.
- Patients who are not likely to benefit from immobilization, who have a low likelihood of spinal injury, should not be immobilized.
- Ambulatory patients may be safely immobilized on cot with cervical collar and straps and will not generally require a spine board.
- Reserve long spine board use for the movement of patients whose injuries limit ambulation and who meet criteria for the use of spinal precautions. Remove from the long board as soon as is practical.

## KEY DOCUMENTATION ELEMENTS

- Patient complaint of neck or spine pain
- Spinal tenderness
- Mental status / GCS
- Neurologic examination
- Evidence of intoxication
- Documentation of multiple trauma
- Documentation of mechanism of injury

## PERTINENT ASSESSMENT FINDINGS

- Mental status
- Neurologic examination
- Evidence of intoxication
- Evidence of multiple trauma with distracting injuries

## QUALITY METRICS

- Percentage of patients with high risk mechanisms of injury and/or signs or symptoms of cervical spine injury who are placed in a cervical collar
- Percentage of trauma patients who are transported on a long backboard

# Tranexamic Acid (TXA)

TXA may only be considered if patient is being transported to a **TRAUMA CENTER** that supports administration of TXA. Consider air medical transport if indicated and applicable per Direct Trauma Transport protocol.

## Criteria

1. Age > 18.
2. Blunt or penetrating trauma
3. Time of injury **less than 3 hours (180 minutes)**. Prefer < 60 minutes from initial traumatic injury.
4. **All 4 of the following signs and symptoms of severe internal or external hemorrhage MUST be present:**
  - a. **SBP  $\leq$  90 mmHg**
  - b. **Pulse Rate  $\geq$  110 bpm**
  - c. **Tachypnea  $\geq$  24 breaths per minute**
  - d. **Evidence of peripheral vasoconstriction including cool, pale skin and delayed capillary refill of > 2 seconds.**
5. Consider consulting medical control for those patients who may benefit from this medication, including impending hemodynamic instability.

## Paramedic

1. **INITIAL TRAUMA CARE**
2. Refer to SHOCK and EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
3. Obtain at least 1 dedicated IV line for TXA, and a second large bore IV site (or IO) for continuous IV fluid administration.
4. **TXA** Administration: **1 gram/10mL in 50mL NS over 10 minutes IV** via 10 drop tubing (1 drop per second) if patient remains hemodynamically unstable and it is suspected that the patient will continue to require aggressive crystalloid administration in the next 24 hours. ***\*According to the manufacturer, TXA should be given via a dedicated IV line.\****
5. During initial report to the receiving facility, and at transition of care, report the time of injury and time of **TXA** loading dose.

# Tranexamic Acid (TXA)

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# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

## History

- Substance
- Time of ingestion or exposure
- Route of exposure
- Quantity of medication or toxin taken
- Alcohol or other intoxicant taken
- Past medical history
- Medications
- Decontamination performed
- Treatment prior to arrival

## Signs and Symptoms

### SLUDGE<sup>M</sup>

- Salivation
- Lacrimation
- Urination; increase, loss of control
- Defecation / Diarrhea
- GI Upset; Abdominal pain)
- Emesis
- Muscle Twitching / Miosis

### Killer B's

- Bradycardia, Bronchorrhea, Bronchospasm
- CNS (headache, confusion, seizures, lethargy or unresponsive)

## Differential

- Nerve agent exposure (e.g. VX, Sarin, Soman, etc.)
- Organophosphate exposure (pesticide)
- Vesicant exposure (e.g. Mustard Gas, etc.)
- Respiratory irritant exposure (e.g. Hydrogen Sulfide, Ammonia, Chlorine, etc.)

## Estimated Level of Exposure

	Signs & Symptoms
<b>Mild</b>	Salivation; Lacrimation; Miosis
<b>Mild to Moderate</b>	Localized swelling; Muscle fasciculations; Nausea and vomiting; Weakness; Shortness of breath
<b>Severe</b>	Unconsciousness; Convulsions; Apnea or severe respiratory distress requiring assisted ventilation; Flaccid paralysis

## EMR & EMT-Basic

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Save all bottles, containers or labels for information without exposing rescuers.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access. Consider **NORMAL SALINE 500 mL bolus** to maintain SBP  $\geq$  90 mmHg or MAP  $\geq$  65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP  $\geq$  90mmHg or MAP  $\geq$  65 mmHg; maximum **2 liters**.
3. If symptomatic, administer **ATROPINE 2 mg IV or IM**.
4. Repeat **ATROPINE 2-4 mg IV** every 3-5 minutes until symptoms of SLUDGE subside, most importantly secretions.
5. If seizures occur, refer to SEIZURE protocol.

# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

## PEARLS

- Continuous and ongoing patient reassessment is critical.
- Clinical response to treatment is demonstrated by the drying of secretion and the easing of respiratory effort.
- Initiation of and ongoing treatment should not be based upon heart rate or pupillary response.
- Atropine is the primary antidote for organophosphate, carbamate, or nerve agent exposures, and repeated doses should be administered liberally to patients who exhibit signs and symptoms of exposure or toxicity.
- Clinical effects of acetylcholinesterase inhibitor agents
  - a. The clinical effects are caused by the inhibition of the enzyme acetylcholinesterase which allows excess acetylcholine to accumulate in the nervous system.
  - b. The excess accumulated acetylcholine causes hyperactivity in muscles, glands, and nerves.
- Organophosphates (certain Insecticides)
  - a. Can be legally purchased by the general public.
  - b. Organophosphates (e.g. pesticides) penetrate tissues and bind to the patient's body fat producing a prolonged period of illness and ongoing toxicity even during aggressive treatment.
- Nerve agents
  - a. Traditionally classified as weapons of mass destruction (WMD).
  - b. Not readily accessible to the general public.
  - c. Extremely toxic and rapidly fatal with any route of exposure.
  - d. GA (tabun), GB (sarin), GD (soman), GF, and VX are types of nerve agents and are WMDs.
  - e. Nerve agents can persist in the environment and remain chemically toxic for a prolonged period of time.

## KEY DOCUMENTATION ELEMENTS

- Time to recognize initial signs and symptoms
- Number of repeated doses of atropine required for the secretions diminish and respirations to improve
- Patient reassessments
- Patient responses to therapeutic interventions
- Measures taken to decontaminate the patient
- Measures taken to protect clean environments from contamination

## PERTINENT ASSESSMENT FINDINGS

- Signs and symptoms exhibited with the toxidromes of **SLUDGE** and **Killer B's**

## QUALITY METRICS

- Recognition and appropriate treatment of patients

# Altitude Illness

## History

- Past medical history
- Prior history of altitude illness
- Patient's itinerary
  - Starting altitude
  - Highest altitude gained
  - Rate of ascent
- Presence of prophylaxis against altitude (i.e. acetazolamide, sildenafil)
- Total altitude descended

## Signs and Symptoms

- (See definitions below)

## Differential

- Carbon monoxide poisoning
- Hypo-/hyperthermia
- Stroke
- Drugs / Alcohol
- Hypoglycemia
- Trauma
- Exhaustion

## Definitions

- **Acute mountain sickness:** Headache plus one or more of the following: anorexia, nausea or vomiting, fatigue or weakness, dizziness or lightheadedness or difficulty sleeping. These symptoms must occur in the setting of recent arrival to high altitude (generally considered greater than 5000 – 7000 feet).
- **High altitude pulmonary edema (HAPE):** Progressive dyspnea, cough, hypoxia, and weakness in high altitude environments (considered greater than 8000 feet). Patients may or may not exhibit symptoms if acute mountain sickness precedes symptoms of HAPE .
- **High altitude cerebral edema (HACE):** Heralded by mental status changes in patients with symptoms of acute mountain sickness including altered mentation, ataxia, or stupor and progressing to coma. Typically seen in high altitude environments (greater than 8000 feet).

## All Levels

1. Ensure scene and rescuer safety.
2. **UNIVERSAL PATIENT CARE.**
3. Perform ABCs and manage airway as necessary.
4. Administer supplemental oxygen to keep oxygen saturations  $\geq 90\%$ .
5. Descend to lower altitude. Descent is the mainstay of therapy and is the definitive therapy for all altitude related illnesses.
  - a. Descent should be initiated as soon as scene conditions permit.

# Altitude Illness

## PEARLS

- Patients suffering from altitude illness have exposed themselves to a dangerous environment. By entering the same environment, providers are exposing themselves to the same altitude exposure. Be vigilant in looking for symptoms of altitude illness amongst rescuers.
- Descent of 500-1000 feet is often enough to see improvements in patient conditions.
- Patients with HAPE are suffering from non-cardiogenic pulmonary edema and may benefit from positive pressure ventilation via either bag assisted ventilation, CPAP, or other means of positive pressure ventilation.
- Patients suffering from altitude illness are commonly dehydrated and require IV fluids.
- HAPE is the most lethal of all altitude illnesses.
- Consider alternate causes of symptoms of AMS - the symptoms of AMS may be caused by alternate etiologies such as carbon monoxide poisoning (in patients cooking within enclosed areas), dehydration, exhaustion, hypoglycemia, hyponatremia.

## KEY DOCUMENTATION ELEMENTS

- Patient's itinerary, including starting altitude, highest altitude gained and rate of ascent
- Presence (or absence) of prophylaxis against altitude (including medications such as acetazolamide, sildenafil)
- Total altitude descended

## PERTINENT ASSESSMENT FINDINGS

- Consider airway management needs in the patient with severe alteration in mental status
- HAPE will present with increasing respiratory distress and rales on exam
- HACE will present with mental status changes, ataxia and progressing to coma

## QUALITY METRICS

# Bites and Envenomation

## History

- Type of bite / sting
- Description of creature or bring photo with patient for identification
- Time, location, size of bite / sting
- Previous reaction to bite / sting
- Domestic vs. Wild
- Tetanus and Rabies risk
- Immunocompromised patient

## Signs and Symptoms

- Rash, skin break, wound
- Pain, soft tissue swelling, redness
- Blood oozing from the bite wound
- Evidence of infection
- Shortness of breath, wheezing
- Allergic reaction, hives, itching
- Hypotension or shock

## Differential

- Animal bite
- Human bite
- Snake bite (poisonous)
- Spider bite (poisonous)
- Insect sting / bite (bee, wasp, ant, tick)
- Infection risk
- Rabies risk
- Tetanus risk

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. If signs of allergic reaction refer to ALLERGIC REACTION / ANAPHYLAXIS Protocol.
3. For Insect Bite:
  - a. Remove stinger if appropriate.
  - b. Remove constricting items.
  - c. Apply ice pack.
  - d. Minimize movement.
4. For Snake Bite:
  - a. Splint limb, bandage and place at level below the heart.
  - b. Minimize movement.
  - c. Remove constricting items.
  - d. Do **NOT** apply ice.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access, as needed.
3. Consider management of pain per the PAIN MANAGEMENT Protocol.

# Bites and Envenomation

## PEARLS

- **Evidence of infection:** Swelling, redness, drainage, fever, red streaks proximal to wound.
- Immunocompromised patients are at an increased risk for infection: Diabetes, chemotherapy, transplant patients.
- Patient may still have an imbedded stinger, tooth, nematocyst, or barb which may continue to deliver toxin if left imbedded. Consider safe removal without squeezing the toxin delivery apparatus.
- **Human bites:** Human bites have higher infection rates than animal bites due to normal mouth bacteria.
- **Dog / Cat / Carnivore bites:** Carnivore bites are much more likely to become infected and all have risk of Rabies exposure. Cat bites may progress to infection rapidly due to a specific bacteria (*Pasteurella multocida*).
- **Snake bites:** Coral snake bites are rare: very little pain but very toxic. "Red on yellow - kill a fellow, red on black - venom lack." Amount of envenomation is variable, generally worse with larger snakes and early in spring.
- **Spider bites:** Black Widow spider bites tend to be minimally painful, but over a few hours, muscular pain and severe abdominal pain may develop (spider is black with red hourglass on belly). Brown Recluse spider bites are minimally painful to painless. Little reaction is noted initially but tissue necrosis at the site of the bite develops over the next few days (brown spider with fiddle shape on back).

## KEY DOCUMENTATION ELEMENTS

- Describe the suspect bite or sting source without risking patient or EMS provider
- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Time of symptoms onset
- Therapy and response to therapy

## PERTINENT ASSESSMENT FINDINGS

- Assess for signs and symptoms of local and systematic impact of the suspected toxin
- Patient may still have an imbedded stinger, tooth, nematocysts or barb which may continue to deliver toxin if left imbedded

## QUALITY METRICS

- Offending organism was managed appropriately without secondary exposure
- Appropriate pain management

# Carbon Monoxide / Smoke Inhalation

## History

- Exposure to Carbon Monoxide
- Time / Duration of exposure
- Smoke inhalation
- Reason: Suicide, criminal, accidental
- Past medical history

## Signs and Symptoms

- Facial burns
- Singed nasal hairs or facial hair
- Shortness of breath
- Facial edema
- Stridor

### Carbon Monoxide

- Mild: Nausea, Fatigue, Headache, Vertigo, Lightheadedness
- Moderate to severe: AMS, Tachypnea, Tachycardia, Convulsion, Cardiopulmonary arrest

## Differential

- Diabetes
- Cardiac (ACS / MI)
- Infection
- Anaphylaxis
- Head injury / Trauma
- Co-ingestant or exposure

## EMR & EMT-Basic

1. Assure scene is safe.
2. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level.
  - b. Apply **OXYGEN 15 LPM** via **NRB**
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access, as needed.
3. Consider the need for early advanced airway if signs of inhalation injury are present. Refer to the AIRWAY MANAGEMENT Protocol.
4. Consider cyanide toxicity in smoke inhalation patients. Refer to the CYANIDE POISONING Protocol.
5. Continue to monitor the patient.

# Carbon Monoxide / Smoke Inhalation

## PEARLS

- Remove patient and response personnel from potentially hazardous environment as soon as possible.
- Provide instruction to the patient, the patient's family, and other appropriate bystanders to not enter the environment (e.g. building, car) where the carbon monoxide exposure occurred until the source of the poisoning has been eliminated.
- CO oximeter devices may yield inaccurate low / normal results for patients with CO poisoning. All patients with probable or suspected CO poisoning should be transported to the nearest appropriate hospital based on their presenting signs and symptoms.
- Pulse oximetry is inaccurate due to the carbon monoxide binding with hemoglobin.
- Consider cyanide toxicity if carbon monoxide poisoning is from a fire.
- Smoke is a dangerous mixture of toxic gases and suspended chemical resulting from combustion. Smoke inhalation is the result of inhaling these heated components. While it may be impossible to predict exactly what components of combustion are inhaled, cyanide (CN) and carbon monoxide (CO) are common elements found in smoke and should be suspected in all smoke inhalation victims.

## KEY DOCUMENTATION ELEMENTS

- If using a carbon monoxide detector, record the level detected
- Evidence of soot or burns around the face, nares or pharynx
- Early and repeat assessment of respiratory status and neuro exam
- Accurate exposure history

## PERTINENT ASSESSMENT FINDINGS

- Early and repeat assessment of patient's mental status and motor function are extremely useful in determining response to therapy and the need for hyperbaric therapy
- Identification of possible etiology of poisoning
- Time of symptom onset and time of initiation of exposure-specific treatment
- Response to therapy

## QUALITY METRICS

- Appropriate protocol selection and management
- Multiple frequent documented reassessments
- Early airway management in the rapidly deteriorating patient



# Cyanide Poisoning

## History

- Exposure to Cyanide (inhalation, ingestion or absorption through skin)
- Time / Duration of exposure
- Smoke inhalation
- Industrial exposure
- Reason: Suicide, criminal, accidental
- Past medical history

## Signs and Symptoms

- CNS (Headache, Anxiety, Weakness, Vertigo)
- Tachycardia / Tachypnea
- Nausea / Vomiting
- Flushed "cherry red" skin

### SEVERE:

- Marked altered LOC
- Seizures
- Respiratory depression or arrest
- Cardiac dysrhythmias

## Differential

- Diabetes
- Cardiac (ACS / MI)
- Infection
- Anaphylaxis
- Head injury / trauma
- Co-ingestant or exposure

## Note

**This protocol assumes a Cyanokit is available.**

## EMR, EMT-Basic & EMT-Intermediate

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **EMR / BLS / ILS TREATMENT.**
2. Establish IV access.
3. **HYDROXOCOBALAMIN (Cyanokit) 5 grams** over 15 minutes.
  - a. Reconstitute: Place the vial of hydroxocobalamin in an upright position; add 200 mL of 0.9% NaCl to the using the transfer spike. Fill to the line.
  - b. Mix: The vial should be repeatedly inverted or rocked, NOT shaken, for at least 60 seconds prior to infusion.
  - c. Infuse Vial: Use vented IV tubing, hang and infuse over 15 minutes.

# Cyanide Poisoning

## PEARLS

- Scene safety is priority!
- Cyanide is a colorless, “bitter almond smell” (genetically only 40% of population can smell) gas or white crystal which binds to the ferric ion in cells, blocking the enzyme cytochrome oxidase, thus preventing the use of oxygen by the cell’s mitochondria, leading to cellular hypoxia.
- There is no widely available, rapid, confirmatory cyanide blood test. Many hospitals will not be able to rapidly assess cyanide levels. Therefore, treatment decisions must be made on the basis of clinical history and signs and symptoms of cyanide intoxication.
- Pulse oximetry accurately reflects serum levels of oxygen but does not accurately reflect tissue oxygen levels therefore should not be relied upon in possible cyanide and/or carbon monoxide toxicity.
- After hydroxocobalamin has been administered, pulse oximetry levels are no longer accurate.
- If the patient ingests cyanide, it will react with the acids in the stomach generating hydrogen cyanide gas. Be sure to maximize air circulation in closed spaces (ambulance) as the patient’s gastric contents may contain hydrogen cyanide gases when released with vomiting or belching.
- If smoke inhalation, always consider carbon monoxide poisoning.
- Smoke is a dangerous mixture of toxic gases and suspended chemical resulting from combustion. Smoke inhalation is the result of inhaling these heated components. While it may be impossible to predict exactly what components of combustion are inhaled, cyanide (CN) and carbon monoxide (CO) are common elements found in smoke and should be suspected in all smoke inhalation victims.

## KEY DOCUMENTATION ELEMENTS

- Repeat evaluation and documentation of signs and symptoms as the patient’s clinical condition may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptoms onset
- Time of treatment
- Therapy and response to therapy

## PERTINENT ASSESSMENT FINDINGS

- Early and repeated assessment is essential

## QUALITY METRICS

- Appropriate protocol selection and management
- Multiple frequent documented reassessments
- Early airway management in the rapidly deteriorating patient

# Dive (SCUBA) Injury / Accidents

## History

- Recent (within 48 hrs) SCUBA diving activity
- Circumstances leading to the dive injury / accident
- Submersion in water regardless of depth
- Duration of submersion / immersion
- Temperature of water (possibility of hypothermia)
- Details of mechanism of injury (c-spine injury?)

## Signs and Symptoms

### Decompression Sickness:

- Joint pain
- Mental status changes
- Paralysis
- Pulmonary (cough, hemoptysis, SOB)

### Nitrogen Narcosis:

- Mental status changes
- Signs of intoxication

## Differential

- Trauma
- Pre-existing medical problem
  - Hypoglycemia
  - Cardiac Dysrhythmias
- Pressure injury (SCUBA diving)
  - Barotrauma
  - Decompression sickness

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. If a SCUBA accident includes associated drowning/near-drowning, refer to DROWNING / SUBMERSION INJURY Protocol.
3. If air embolism suspected, place in left lateral recumbent position (patient lying with the left side down, knees drawn upward, and flat)
4. Apply **OXYGEN** as needed with a target oxygen saturation of 94-98%.
  - a. Patients with symptoms suspicious for decompression illness should be placed on supplemental oxygen regardless of saturations to enhance washout of inert gas.
5. If patient presents with hypothermia, refer to ENVIRONMENTAL HYPOTHERMIA Protocol.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Consider CPAP to supplement the awake patient's own spontaneous respiratory effort in patients with signs or symptoms of respiratory difficulty.
  - a. Do NOT use CPAP in patients for whom pulmonary barotrauma is a consideration.
3. Establish IV access.
4. Advanced airway management as indicated. Refer to the AIRWAY MANAGEMENT Protocol.

# Dive (SCUBA) Injury / Accidents

## PEARLS

- If the patient is still in the water, seek safest and most rapid means of safe removal (within your scope of training) while minimizing risk of further injury.
- Seek assistance early for special rescue/extrication and transportation needs.
- Check for multiple patients (e.g. group dive, table calculation error(s) or contaminated dive gases).
- Rescue efforts should be coordinated between all responding agencies to ensure that the patient is rapidly accessed and safely removed from the water if diver unable to do so themselves.
- Decompression illness may have a variety of presentations depending on system affected (e.g. skin, joint(s), pulmonary, neurologic).
- SCUBA accidents/incidents can result in a variety of issues, including barotrauma, air embolism and decompression illness.

## KEY DOCUMENTATION ELEMENTS

- Water temperature, if available
- Dive history
  - Number of dives in recent days
  - “Bottom time” in dives
  - Maximum depth
  - Rate of ascent
  - Dive gas (e.g. air vs. mixed gases such as Nitrox, Heliox or Trimix)
- Timing of onset of symptoms
- History of altitude exposure after diving (air travel)
- Any associated injuries or exposures

## PERTINENT ASSESSMENT FINDINGS

- Vital signs findings
- Neurologic status assessment findings
- Respiratory assessment findings (e.g. oxygen saturation, respiratory rate)
- Subcutaneous emphysema

## QUALITY METRICS

- Recognition and appropriate care of pulmonary/respiratory complaints
- Cervical spine management when appropriate

# Drowning / Submersion Injury

## History

- Circumstances leading to the submersion
- Submersion in water regardless of depth
- Duration of submersion / immersion
- Temperature of water (possibility of hypothermia)
- Details of mechanism of injury (c-spine injury?)

## Signs and Symptoms

- Unresponsive
- Mental status changes
- Decreased or absent vital signs
- Foaming / Vomiting
- Coughing, Wheezing, Rales, Rhonchi, Stridor
- Apnea

## Differential

- Trauma
- Pre-existing medical problem
  - Hypoglycemia
  - Cardiac Dysrhythmias
- Pressure injury (diving)
  - Barotrauma
  - Decompression sickness

## EMR & EMT-Basic

1. Approach scene with due caution for rescuer safety.
2. Remove patient from water with spinal motion restriction precautions. Refer to SPINAL MOTION RESTRICTION Protocol.
3. **UNIVERSAL PATIENT CARE**.
4. Apply **OXYGEN** as needed with a target oxygen saturation of 94-98%.
5. If patient becomes pulseless and apneic, refer to CARDIAC ARREST Protocol.
6. If patient presents with hypothermia, refer to ENVIRONMENTAL HYPOTHERMIA Protocol.
7. If patient was involved in SCUBA diving accident, refer to DIVE (SCUBA) INJURY / ACCIDENT Protocol.
8. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Consider CPAP to supplement the awake patient's own spontaneous respiratory effort in patients with signs or symptoms of respiratory difficulty.
3. Establish IV access.
4. Advanced airway management as indicated. Refer to the AIRWAY MANAGEMENT Protocol.

# Drowning / Submersion Injury

## PEARLS

- The World Health Organization definition of drowning is “the process of experiencing respiratory impairment from submersion / immersion in liquid”.
- Drowning is further defined in the following categories:
  - a. Non-fatal drowning – patients rescued from drowning.
  - b. Fatal drowning – any death, acutely or subacutely, resultant from drowning.
- Submersion refers to situations in which the patient’s airway is underwater. Immersion refers to situations in which the patient’s body is in water but the patient’s airway remains out of the water.
- Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water.
- Initiation of in-water ventilations may increase survival – In-water chest compressions are futile.
- Long-standing teaching has suggested that rescuers should always assume c-spine injury in victims of drowning.
  - a. The 2010 American Heart Association update on special circumstances in cardiac arrest notes that routine c-spine precautions in all victims of drowning is likely unnecessary unless the mechanism or injury, history, or physical exam suggests a cervical spine injury.
  - b. Mechanisms of injury highly suggestive of cervical spine injury include diving, water skiing, surfing or watercraft accidents.
- Patients may develop subacute respiratory difficulty after drowning and therefore all victims of drowning should be transported for observation.
- Consider CPAP early if respiratory distress in awake patients, if adequate mask seal can be established.
- Hypothermia is often associated with drowning and submersion injuries even with warm ambient conditions.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury or history suggesting cervical spine injury
- Submersion time
- Water temperature
- Activities leading to drowning

## PERTINENT ASSESSMENT FINDINGS

- Cardiac arrest in drowning is caused by hypoxia, airway and ventilation are equally important to CPR
- Assess for other associated injuries such as injuries to the head / neck or dive-related emergencies

## QUALITY METRICS

- Recognition and appropriate care of pulmonary / respiratory complaints
- Cervical spine management when appropriate

# Environmental Hyperthermia

## History

- Age
- Oral intake
- Past medical history / Medications
- Alcohol or Illicit drug use
- Ambient temperature and humidity
- Exertion level
- Duration of exposure
- Fatigue and/or muscle cramping

## Signs and Symptoms

- Altered mental status / Coma
- Hot, dry or sweaty skin
- Hypotension or shock
- Seizures
- Nausea / Vomiting
- Headache
- Cramps

## Differential

- Fever (infection)
- Dehydration
- Medication induced (neuroleptic malignant syndrome, malignant hyperthermia)
- Hyperthyroidism (Thyroid Storm)
- Delirium Tremens (DT's)
- Heat cramps, exhaustion, stroke
- CNS lesions or tumors

## Definitions

**Heat Cramps:** are minor muscle cramps usually in the legs and abdominal wall. Patient temperature is normal.

**Heat Exhaustion:** has both salt and water depletion usually of a gradual onset. As it progresses tachycardia, hypotension, elevated temperature, and very painful cramps occur. Symptoms of headache, nausea and vomiting occur. Heat exhaustion can progress to heat stroke. Skin usually cool and moist.

**Heat Stroke:** occurs when the cooling mechanism of the body (sweating) ceases due to temperature overload and/or electrolyte imbalances. Patient temperature is usually *greater than* 104°F. When no thermometer is available, it is distinguished from heat exhaustion by altered level of consciousness. Skin usually hot and dry.

## Heat Cramps

### EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Remove patient to a cool environment.
3. If nausea and vomiting not present, have patient drink oral fluids, preferably electrolyte solutions.
4. **DO NOT** massage cramping muscles.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. If no response to electrolyte solution or none is available, establish IV access and administer **NORMAL SALINE 500 mL bolus**.
3. If patient remains symptomatic, repeat fluid bolus as long as lungs remain clear; maximum **2 liters**.

Protocol Continues 

# Environmental Hyperthermia

## **Heat Exhaustion / Stroke**

### **EMR & EMT-Basic**

1. **UNIVERSAL PATIENT CARE.**
2. Remove patient to a cool environment.
3. Manage airway as needed per the AIRWAY MANAGEMENT Protocol.
4. Check blood glucose level. If glucose < 60 mg/dL refer to DIABETIC EMERGENCIES Protocol.
5. Initiate active cooling:
  - a. Remove patient's clothing; protect privacy.
  - b. Cool patient with water and fans.
  - c. Apply cold packs to neck, groin and armpits.
  - d. Cover patient with cool, wet sheets and fan.
  - e. **DO NOT** induce shivering. Stop cooling if shivering occurs.
6. Avoid fluids by mouth, especially if patient is nauseated.
7. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### **EMT-Intermediate & Paramedic**

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **NORMAL SALINE 500 mL bolus**.
4. If patient remains symptomatic, repeat fluid bolus as long as lungs remain clear; maximum **2 liters**.
5. Be prepared to treat seizures per SEIZURE Protocol.



# Environmental Hyperthermia

## PEARLS

- Extremes of age are more prone to heat emergencies (i.e. young and old).
- Heat exposure can occur either due to increased environmental temperatures or prolonged exercise or a combination of both.
  - a. Environments with temperature *greater than 90°F* and humidity *greater than 60%* present the most risk.
- Contributory risk factors may come from:
  - a. Prescription and over-the-counter herbal supplements
  - b. Cold medications
  - c. Heart medications
  - d. Diuretics
  - e. Psychiatric medications
  - f. Drug abuse (i.e. cocaine, amphetamines and salicylates)
  - g. Accidental or intentional drug overdose
- Heat stroke is associated with cardiac arrhythmias independent of drug ingestion / overdose.
- Sweating *generally* disappears as body temperatures rise over 104°F although sweating (or lack of sweating) can be an unreliable indicator of the severity of heat illness.
- Do not forget to look for other causes of altered mental status such as low blood glucose level, or, in the proper circumstances (e.g. endurance exercise events), consider exercise associated hyponatremia (EAH), especially in the patient with altered mental status, normal blood glucose, and normal temperature.

## KEY DOCUMENTATION ELEMENTS

- Patient assessment includes medication / drug use and detailed past medical history
- Patient temperature and physical exam
- Environmental assessment performed
- Cooling interventions considered and implemented

## PERTINENT ASSESSMENT FINDINGS

- Warning signs: fever, altered mental status
- Blood glucose level for altered mental status

## QUALITY METRICS

- Blood glucose level obtained
- Fluids given for hypotension
- Attempts to reduce core temperature

# Environmental Hyperthermia

**Intentionally Left  
Blank**

# Environmental Hypothermia / Frostbite

## History

- Age
- Ambient temperature
- Exposure to wind / water
- Duration of exposure
- Past medical history / Medications
- Alcohol or illicit drug use

## Signs and Symptoms

- Altered mental status / Coma
- Cold, clammy
- Shivering
- Extremity pain or sensory abnormality
- Bradycardia
- Hypotension or shock

## Differential

- Metabolic disorders (hypoglycemia, hypothyroidism)
- Sepsis
- Environmental exposure
- Shock
- CNS dysfunction (stroke, brain injury, spinal cord injury)

## Hypothermia

### Classification

	Temperature	Signs & Symptoms
<b>Mild</b>	89.6°-95°F (32°-35°C)	Normal Vitals; Normal mental status; shivering is preserved; body maintains ability to control temperature.
<b>Moderate</b>	82.4°-89.6°F (28°-32°C)	Progressive bradycardia, hypotension, and decreased respirations, alterations in mental status with eventual coma, shivering will be lost in moderate hypothermia (generally between 31-30° C), and general slowing of bodily functions; the body loses ability to thermoregulate.
<b>Severe</b>	< 82.4°F	

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Cautiously assess pulse for one full minute; unnecessary CPR could precipitate ventricular fibrillation. If patient has a pulse go to step #5.
3. If patient is pulseless and apneic after one full minute, refer to HYPOTHERMIC CARDIAC ARREST section.
4. Manage airway per the AIRWAY MANAGEMENT Protocol; assist ventilations with BVM but do not hyperventilate as hypocarbia may reduce the threshold for V-Fib in the cold patient.
5. Handle patient gently; DO NOT massage cold extremities.
6. Move patient to a warm environment; remove any wet clothing and replace with dry sheets and blankets.
7. Hot packs may be applied to arm pits, groin and abdominal areas.
8. Assess and treat for other injuries as necessary.
9. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **NORMAL SALINE 500 mL** fluid bolus and reassess patient. Use warmed (102°-106°F) fluid if available.
4. May repeat fluid bolus as needed as long as lungs remain clear; maximum **2 liters**.

# Environmental Hypothermia / Frostbite

## **Frostbite**

### **Patient Presentation**

Patients with frostbite will develop numbness involving the affected body part along with a “clumsy” feeling and areas of blanched skin - later findings include decreased or loss of sensation, bruising or blister formation, white and waxy appearance to affected tissue, or feeling like a block of wood.

### **All Levels**

1. Remove from cold.
2. **UNIVERSAL PATIENT CARE.**
3. Do NOT massage frostbitten extremities.
4. Cover frostbitten nose or ears with a warm hand.
5. Have patient place frostbitten hand in his / her armpit.
6. If ETA is greater than 60 minutes, begin active rewarming:
  - a. Immerse extremity in circulating water maintained at a temperature of 100-105 F.
  - b. Rewarming should take 30-60 minutes.
  - c. Rewarming is complete when frozen area is warm to touch and deep red or bluish in color.
  - d. After rewarming, dry gently and cover part with dry sterile dressing and elevate on pillow.
  - e. Do NOT allow to refreeze.

# Environmental Hypothermia / Frostbite

## **Hypothermic Cardiac Arrest**

### **EMR & EMT-Basic**

1. Cautiously assess pulse for one full minute; unnecessary CPR could precipitate ventricular fibrillation.
2. Begin CPR and apply AED. Follow CARDIAC ARREST Protocol.
3. Manage airway per AIRWAY MANAGEMENT.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### **EMT-Intermediate & Paramedic**

1. Continue **EMR / BLS TREATMENT**.
2. Follow appropriate dysrhythmia protocol.
3. Establish IV access.
4. **NORMAL SALINE** at wide open rate; use warm solution (102°-106°F) if available.

### **PEARLS**

#### **Hypothermic Cardiac Arrest**

- The following are contraindications for initiation of resuscitation in the hypothermic patient:
  - a. Obvious fatal injuries (such as decapitation).
  - b. The patient exhibits signs of being frozen (such as ice formation in the airway).
  - c. Chest wall rigidity such that compressions are impossible.
  - d. Danger to rescuers or rescuer exhaustion
- Fixed and dilated pupils, apparent rigor mortis, and dependent lividity may not be contraindication for resuscitation in the severely hypothermic patient.
- The mainstay of therapy in severe hypothermia and cardiac arrest should be effective chest compressions and attempts at rewarming. Chest compressions should be provided at the same rate as in normothermic patients.
- The temperature at which defibrillation should first be attempted in the severely hypothermic cardiac arrest victim and the number of defibrillation attempts is unclear. There are different approaches regarding resuscitation of the hypothermic arrest patient.
  - a. Per the American Heart Association (AHA), if the patient has a shockable rhythm (VF/VT), defibrillation should be attempted – it is reasonable to continue defibrillation attempts per AHA protocols concurrently with rewarming strategies.
- There is little evidence to guide use of medications in severe hypothermia with cardiac arrest, however 2010 AHA updates to advanced cardiac life support recommend use of vasopressors according to standard ACLS guidelines.
- Patients with severe hypothermia and arrest may benefit from resuscitation even after prolonged downtime, and survival with intact neurologic function has been observed even after prolonged resuscitation.

# Environmental Hypothermia / Frostbite

## PEARLS

- Extremes of age are more susceptible (i.e. young and old).
- If the temperature is unable to be measured, treat the patient based on the suspected temperature.
- Given the additive effects of additional cold stress, the patient should be removed from the cold environment as soon as operationally feasible.
- In patients suffering from moderate to severe hypothermia, it is critical to not allow these patients to stand or exercise as this may cause circulatory collapse.
- Devices that self-generate heat (e.g. heat packs) that are being utilized during the rewarming process should be wrapped in a barrier to avoid direct contact with the skin and to prevent burns. In patients who are unresponsive, or unable to recognize a developing injury, please check the area in which the heating pad is placed regularly to ensure no tissue damage occurs.

## KEY DOCUMENTATION ELEMENTS

- Duration of cold exposure
- Ambient temperature
- Rewarming attempts or other therapies performed by EMS and prior to EMS arrival
- Patient use of alcohol and/or drugs

## PERTINENT ASSESSMENT FINDINGS

- Identification of associated traumatic injuries (when present)
- Identification of localized freezing injuries
- Patient core temperature (when available)

## QUALITY METRICS

- Patient core temperature and means of measurement (when available)
- Presence of cardiac dysrhythmias
- Documentation of associated trauma (when present)
- Blood glucose level obtained

# Lightning / Lightning Strike Injury

## History

- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

## Signs and Symptoms

- Respiratory distress / Apnea
- Dysrhythmias
- Seizures
- Dizziness / Vertigo
- Loss of consciousness
- Paralysis
- Burns, pain, swelling
- Cardiopulmonary arrest

## Differential

- Burns—Superficial (1<sup>st</sup> Degree), Partial Thickness (2<sup>nd</sup> Degree), Full Thickness (3<sup>rd</sup> Degree)
- Cardiopulmonary arrest
- Altered mental status
- Seizures
- Dysrhythmias

## EMR & EMT-Basic

1. Ensure scene and rescuer safety. Recognize that repeat strike is a risk.
2. **UNIVERSAL PATIENT CARE.**
3. Assure patent airway. Refer to AIRWAY MANAGEMENT Protocol.
4. If in cardiopulmonary arrest, treat per CARDIAC ARREST Protocol.
5. Treat burns per BURNS Protocol.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Advanced airway management as indicated. Refer to AIRWAY MANAGEMENT Protocol.
3. Establish IV access.
4. Acquire 12-lead ECG. Monitor ECG for potential arrhythmias.
5. Consider early management of pain per the PAIN MANAGEMENT Protocol.

# Lightning / Lightning Strike Injury

## PEARLS

- Recognize that repeat strike is a risk. Patient and rescuer safety is paramount.
- Victims do not carry or discharge a current, so the patient is safe to touch and treat.
- Lightning strike cardiopulmonary arrest patients have a high rate of successful resuscitation, if initiated early, in contrast to general cardiac arrest statistics.
- There may be multiple victims.
- If multiple victims, cardiac arrest patients whose injury was witnessed or thought to be recent should be treated first and aggressively (reverse from traditional triage practices).
  - a. Patients suffering cardiac arrest from lightning strike initially suffer a combined cardiac and respiratory arrest.
  - b. Return of spontaneous circulation may precede resolution of respiratory arrest.
  - c. Patients may be successfully resuscitated if provided proper cardiac and respiratory support, highlighting the value of “reverse triage”.
- It may not be immediately apparent that the patient is a lightning strike victim.
- Injury pattern and secondary physical exam findings may be key in identifying patient as a victim of lightning strike.
- Fixed / dilated pupils may be a sign of neurologic insult, rather than a sign of death / impending death – Should not be used as a solitary, independent sign of death for the purpose of discontinuing resuscitation in this patient population.
- Lightning strike is a result of very high voltage, very short duration DC current exposure.

## KEY DOCUMENTATION ELEMENTS

- Initial airway status
- Initial cardiac rhythm
- Neurologic exam (initial and repeat)
- Associated / Secondary injuries
- Pain scale documentation / Pain management

## PERTINENT ASSESSMENT FINDINGS

- Presence of thermal or non-thermal burns
- Evidence of trauma
- Evidence of focal neurologic deficits

## QUALITY METRICS

- Patient transported to most appropriate hospital.
- Pain appropriately managed.
- Airway assessment and early and aggressive management



# Poisoning and Overdose

## History

- Ingestion or suspected ingestion of a potentially toxic substance
- Substance ingested, route, quantity
- Alcohol or other intoxicant ingested
- Time of ingestion
- Reason of ingestion (suicidal, accidental, criminal)
- Available medications at home
- Past medical history
- Medications

## Signs and Symptoms

- Mental status changes
- Hypotension / Hypertension
- Decreased respiratory rate
- Tachycardia, dysrhythmias
- Seizures
- SLUDGE / DUMBELS

\*See *TOXIDROME* section

## Differential

- Tricyclic antidepressants (TCAs)
- Acetaminophen (Tylenol)
- Aspirin
- Depressants
- Stimulants
- Anticholinergic
- Cardiac medications
- Solvents, Alcohols, Cleaning agents
- Insecticides (organophosphates)

## Toxidromes

### Anticholinergic

- Red as a beet (Flushed skin)
- Dry as a bone (Dry skin)
- Mad as a hatter (Altered mental status)
- Blind as a bat (Mydriasis)
- Hot as a pistol (Hyperthermia)
- Full as a flask (urinary retention)
- “Tachy” like a pink flamingo (tachycardia and hypertension)

### Cholinergic

(DUMBELS) DUMBELS is a mnemonic used to describe the signs and symptoms of acetylcholinesterase inhibitor agent poisoning. SLUDGEM is an alternative mnemonic.

- **D**iarrhea
- **U**rination
- **M**iosis/**M**uscle weakness
- **B**ronchospasm/**B**ronchorrhea/**B**radycardia (killer Bs)
- **E**mesis
- **L**acrimation
- **S**alivation/**S**weating

### Opioids

- Respiratory depression
- Miosis (pinpoint pupils)
- Altered mental status
- Decreased bowel sounds

### Sedative Hypnotic

- Central nervous system depression
- Ataxia (unstable gait or balance)
- Slurred speech
- Normal or depressed vital signs (pulse, respirations, blood pressure)

### Stimulants / Hallucinogenics (Sympathomimetic)

- Tachycardia, tachydysrhythmias
- Hypertension
- Diaphoresis
- Delusions/paranoia
- Seizures
- Hyperthermia
- Mydriasis (dilated pupils)

### Serotonin Syndrome (presentation with at least three of the following)

- Agitation
- Ataxia
- Diaphoresis
- Diarrhea
- Hyperreflexia
- Mental status changes
- Myoclonus
- Shivering
- Tremor
- Hyperthermia
- Tachycardia

Protocol Continues

# Poisoning and Overdose

## EMR & EMT-Basic

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Save all bottles, containers and labels for information. **DO NOT EXPOSE RESCUERS TO POISONOUS SUBSTANCES.**
4. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
5. If the patient has inadequate respiratory effort from a confirmed or suspected opioid overdose, administer **NALOXONE**
  - a. **IN – 1 mg/mL per nostril** via atomizer\* (1 mL per nostril maximum; **2 mg total dose**). May repeat in 2-3 minutes to a maximum dose of 4 mg if no response.
  - b. Not given to restore consciousness.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access.
3. Consider **NORMAL SALINE 500 mL bolus** to maintain SBP ≥ 90 mmHg or MAP ≥ 65 mmHg. Repeat fluid bolus as needed as long as lungs remain clear to maintain SBP ≥ 90mmHg or MAP ≥ 65 mmHg; maximum **2 liters**.
4. Apply cardiac monitor to include pulse oximetry and waveform capnography.
  - a. Monitor ECG with special attention to rate, rhythm, QRS and QT duration
5. If patient has inadequate respiratory effort from a confirmed or suspected opioid overdose, administer **NALOXONE**: (*Titrate to adequate ventilation and oxygenation. Not given to restore consciousness.*)  
**IV or IM – 0.4 mg**; may repeat every 2-3 minutes to a maximum dose of 4 mg, if no response.  
**IN – 1 mg/mL per nostril** via atomizer\* (1 mL per nostril maximum; **2 mg total dose**)  
May repeat in 2-3 minutes to a maximum dose of 4 mg if no response.
6. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
7. Call for intercept per INTERCEPT CRITERIA.

Protocol Continues 

# Poisoning and Overdose

## Paramedic

1. Continue ILS TREATMENT.

<u>Overdose Agent</u>	<u>Treatment</u>
<b>Acetylcholinesterase Inhibitors</b> (Carbamates, Nerve Agents, Organophosphates) Exposure	1. Refer to <u>ACETYLCHOLINESTERASE INHIBITORS (CARBAMATES, NERVE AGENTS, ORGANOPHOSPHATES) EXPSOURE</u> Protocol.
<b>Beta Blocker and Calcium Channel Blocker</b>	1. For symptomatic bradycardia, refer to <u>BRADYCARDIA</u> Protocol. 2. For symptomatic patients with cardiac effects (i.e. hypotension, bradycardia) administer <b>GLUCAGON 2mg IV or IM</b>
<b>Opioid</b>	1. If airway compromise or inadequate respiratory effort present from a confirmed or suspected opioid overdose, administer <b>NALOXONE</b> :  <b>IV or IM – 0.4 mg</b> ; may repeat every 2-3 minutes to a <u>maximum dose of 4 mg</u> , if no response.  <b>IN – 1 mg/ml per nostril</b> via atomizer* (1 mL per nostril maximum; <b>2 mg total dose</b> ) May repeat in 2-3 minutes to a <u>maximum dose of 4 mg</u> if no response.
<b>Stimulant and Hallucinogenic</b> (Cocaine, Amphetamines, PCP, MDM/Ecstasy, bath salts, spice, K2, Synthetic THC)	1. Treat chest pain as ACS and follow <u>CHEST PAIN</u> Protocol. 2. Obtain 12-lead ECG. 3. Consider <b>MIDAZOLAM</b> to reduce agitation for patient and provider safety. Refer to <u>BEHAVIORAL EMERGENCIES</u> Protocol. 4. If hyperthermia suspected, begin external cooling.
<b>Tricyclic Antidepressant</b>	1. If widened QRS (> 100 msec), administer <b>SODIUM BICARBONATE 1 mEq/kg IV</b> .

# Poisoning and Overdose

## PEARLS

- Each toxin or overdose has unique characteristics which must be considered in individual protocol.
- If possible, bring container / bottles, and/or contents with the patient to the Emergency Department.
- Monitor patient airway, breathing, pulse oximetry, EtCO<sub>2</sub> for adequate ventilation as they may change over time. Supportive care.
- Repeat vital signs often.
- Monitor level of consciousness.
- Monitor ECG with special attention to rate, rhythm, QRS and QT duration.
- Maintain or normalize patient temperature.
- Do not rely on patient history of ingestion, especially in suicide attempts.

## Specific Signs / Symptoms

- **Tricyclic:** 4 major areas of toxicity: seizures, dysrhythmias, hypotension, decreased mental status or coma; rapid progression from alert mental status to death.
- **Acetaminophen:** Initially asymptomatic or nausea / vomiting. If not detected and treated, causes irreversible liver failure.
- **Aspirin:** Early signs consist of abdominal pain and vomiting. Tachypnea and altered mental status may occur later. Renal dysfunction, liver failure, and or cerebral edema can take place later.
- **Depressants:** Bradycardia, hypotension, decreased temperature, decreased respirations, non-specific pupils.
- **Stimulants:** Tachycardia, hypertension, increased temperature, dilated pupils, seizures.
- **Anticholinergic:** Tachycardia, increased temperature, dilated pupils, mental status changes.
- **Cardiac Medications:** Dysrhythmias and mental status changes.
- **Solvents:** Nausea, coughing, vomiting, and mental status changes.
- **Insecticides:** Increased or decreased HR, increased secretions, nausea, vomiting, diarrhea, pinpoint pupils.

## KEY DOCUMENTATION ELEMENTS

- Repeat evaluation and documentation of signs and symptoms, as patient's clinical condition may deteriorate rapidly
- Identification of possible etiology of poisoning
- Initiating measures on scene to prevent exposure of bystanders when appropriate / indicated
- Time of symptoms onset and time of initiation of exposure-specific treatment

## PERTINENT ASSESSMENT FINDINGS

- Frequent reassessment is essential as patient deterioration can be rapid and catastrophic

## QUALITY METRICS

- Early airway management in the rapidly deteriorating patient
- Accurate exposure history (Time, Route, Quantity, Alcohol or other intoxicants taken)
- Multiple frequent documented reassessments

# Radiation Exposure

## History

- Type of exposure
- Inhalation injury
- Time of injury
- Time of GI symptom onset
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

## Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension / Shock
- Airway compromise / distress could be indicated by hoarseness / wheezing

## Differential

- Superficial (1<sup>st</sup> Degree) red and painful
- Partial Thickness (2<sup>nd</sup> Degree) blisters
- Full Thickness (3<sup>rd</sup> Degree) painless/charred or leathery skin
- Thermal burns
- Chemical burns
- Electrical burns
- Blast injury

## EMR & EMT-Basic

1. Ensure scene and rescuer safety.
  - a. Don standard PPE capable of preventing skin exposure to liquids and solids (gown and gloves), mucous membrane exposure to liquids and particles (face mask and eye protection), and inhalational exposure to particles (N95 face mask or respirator).
2. **UNIVERSAL PATIENT CARE.**
  - a. Identification and treatment of life-threatening injuries and medical problems takes priority over decontamination.
3. Treat burns per BURNS Protocol.
4. Treat nausea and vomiting per NAUSEA / VOMITING Protocol.
  - a. Document the time of GI symptom onset.
5. Treat seizures per SEIZURE Protocol.
6. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Treat nausea and vomiting per NAUSEA / VOMITING Protocol.
4. Treat seizures per SEIZURE Protocol.

## Pertinent Assessment Findings

- Time to nausea and vomiting is a reliable indicator of the received dose of ionizing radiation. The more rapid the onset of vomiting, the higher the whole-body dose of radiation.
- Tissue burns are a late finding (weeks following exposure) of ionizing radiation injury. If burns are present acutely, they are from a thermal or chemical mechanism.
- Seizures may suggest acute radiation syndrome if accompanied by early vomiting. If other clinical indicators do not suggest a whole-body dose of greater than 20Gy, consider other causes of seizure.

# Radiation Exposure

## PEARLS

- Contaminated patients pose very little threat to medical providers who use appropriate PPE including N95 masks or respirators, gloves, gowns, and face and eye protection.
- Sources of radiation
  - a. Legal
    - i. Industrial plants
    - ii. Healthcare facilities that provide radiologic services
    - iii. Nuclear power plants
    - iv. Mobile engineering sources (e.g. construction sites that are installing cement)
  - b. Illegal
    - i. Weapons of mass destruction
    - ii. "Dirty bomb" design to contaminate widespread areas
- Physiology of radiation poisoning
  - a. Contamination – Poisoning from direct exposure to a radioactive source, contaminated debris, liquids, or clothing where radiation continues to be emitted from particles on surface.
  - b. Exposure – Poisoning from radioactivity, in the form of ionizing rays, penetrating through the bodily tissues of the patient.
- Common types of radioactivity that cause poisoning
  - a. Gamma rays
    - i. Highest frequency of ionizing rays
    - ii. Penetrates the skin deeply
    - iii. Causes the most severe radiation toxicity
  - b. Beta rays - Can penetrate up to 1 cm of the skin's thickness
  - c. Alpha rays
    - i. Lowest frequency of ionizing rays
    - ii. Short range of absorption
    - iii. Dangerous only if ingested or inhaled
  - d. Radioactive daughters
    - i. Products of decay of the original radioactive substance
    - ii. Can produce gamma and beta rays (e.g. uranium decays into a series of radon daughters)
- In general, trauma patients who have been exposed to or contaminated by radiation should be triaged and treated on the basis of the severity of their conventional injuries.
- A patient who is contaminated with radioactive material (e.g. flecks of radioactive material embedded in their clothing and skin) generally poses a minimal exposure risk to medical personnel.

## KEY DOCUMENTATION ELEMENTS

- Duration of exposure to the radioactive source or environment
- Distance (if able to be determined) from the radioactive source (if known)
- Time of onset of vomiting

## PERTINENT ASSESSMENT FINDINGS

- Treatment of life-threatening injuries or medical conditions takes priority over assessment for contamination or initiation of decontamination

## QUALITY METRICS

- Use of appropriate Personal Protective Equipment (PPE)

# East Central Illinois EMS System



**Pediatric**



**Protocol Manual**

**2020**





# Preface

The following medical treatment protocols were developed for use by credentialed providers within the OSF HealthCare East Central Illinois EMS System. Optimal prehospital care results from a combination of careful patient assessment, essential prehospital emergency medical services and appropriate medical consultation. The purpose of this manual is to provide guidance for prehospital care providers within the East Central Illinois EMS System. These protocols were adapted based on the NASEMSO National Model EMS Guidelines Version 2.2, IDPH Illinois Emergency Medical Services for Children Pediatric Prehospital Protocols, AHA guidelines, as well as other evidence-based information from local and national standards.

In this document, **pediatric patients are defined as age 15 years and younger**, consistent with the Emergency Medical Services and Trauma Center Code adopted by the Illinois Department of Public Health. Other terms commonly applied to the pediatric population include: "newly born" (under 24 hours), "neonates" (1-28 days) and "infant" (1-12 months).

The medical protocols are divided into different sections. The upper section includes three boxes (History, Signs and Symptoms and Differential) which serve as a guide to assist in obtaining pertinent patient information and exam findings as well as considering multiple potential causes of the patient's complaint. It is not expected that every historical element or sign / symptom be recorded for every patient, however the pertinent aspects shall be included in the patient evaluation. The protocol section describes the essentials of patient care. Virtually every patient should receive the care outlined in this section. However, each medical emergency must be dealt with individually and appropriate care determined accordingly. Professional judgment is mandatory in determining treatment modalities within the parameters of these protocols. Circumstances will arise where treatment may move from one protocol to another. The *'Pearls'* section provides key points and educational pearls regarding the protocol. The *'Key Documentation Elements'* and the *'Pertinent Assessment Findings'* sections serve to help the prehospital provider in appropriate documentation of the patient encounter. The final section, *'Quality Metrics'*, was added in an effort for continuous quality improvement. These metrics were based on the NASEMSO National Model EMS Guidelines Version 2.2 as well as metrics specific to East Central Illinois EMS.

From time to time, protocols may be added or revised. Additional recommendations are welcome and appreciated at any time. They may be submitted to the East Central Illinois EMS office for consideration.

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\*\*This document may not be amended or altered; however, it may be reproduced and distributed within the East Central Illinois EMS System.

# Preface

## Introductory Letter to the System

The vision of the East Central Illinois EMS System is to be an integrative, high performance EMS system aligning EMS agencies and providers to meet community-centered needs through clinical excellence, education, access and advocacy. These new protocols are one example of the multifaceted strategy we take in order to achieve our vision. These new protocols are intended to be the guidelines and framework of a team-based approach to prehospital care within our system.

These protocols are a “living document” and are subject to continuous review for the sake of providing providers with the most current evidence-based treatment. Updates to these protocols will be made as needed to maintain a current standard of care. We welcome your input and encourage suggestions in an effort to deliver the highest quality of prehospital health care possible.

Sincerely,

Kurt Bloomstrand, MD, FACEP, FAAEM

EMS Medical Director

East Central Illinois EMS

OSF HealthCare

# Preface

The protocol section is divided and color coded based on the level of prehospital provider licensure.

## Legend



## Definition

Emergency Medical Responder (EMR)



Emergency Medical Technician—Basic (EMT-Basic)



Emergency Medical Technician-Intermediate (EMT-I)



Paramedic Only



Medical Control



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# Universal Patient Care

## Scene size up

- Identify possible hazards.
- Assure safety for patient and responder.
- Observe for mechanism of injury / nature of illness.
- Note anything suspicious at the scene, i.e., medications, household chemicals, other ill family members.
- Assess any discrepancies between the history and the patient presentation, i.e., infant fell on hardwood floor; however floor is carpeted.
- Initiate appropriate body substance isolation (BSI) precautions.
- Determine the number of patients.

## General Approach to the Stable / Conscious Pediatric Patient

- A. Assessments and interventions must be tailored to each child in terms of age, size and development.
  - Make eye contact and smile at the child.
  - Keep voice at even quiet tone, don't yell.
  - Speak slowly; use simple, age appropriate terms.
  - Use toys or penlight as distractors; make a game of assessment.
  - Keep small children with their caregiver(s); encourage assessment while caregiver is holding child.
  - Kneel down to the level of the child if possible.
  - Be cautious in use of touch. In the stable child, make as many observations as possible before touching (and potentially upsetting) the child.
  - Adolescents may need to be interviewed without their caregivers present if accurate information is to be obtained regarding drug use, alcohol use, LMP, sexual activity, child abuse.
- B. While walking up to the patient, observe / inspect the following:
  - General appearance, age appropriate behavior. Does child have a malnourished appearance? Is child looking around, responding with curiosity or fear, playing, sucking on a pacifier or bottle, quiet, eyes open but not moving much or uninterested in environment?
  - Obvious respiratory distress / increased work of breathing: retractions, nasal flaring, accessory muscle use, head bobbing, grunting.
  - Color: pink, pale, flushed, cyanotic, mottled.
  - Position of the child. Are the head, neck or arms being held in a position suggestive of spinal injury? Is the patient sitting up or tripodding?
  - Level of consciousness, i.e., awake vs asleep or unresponsive.
  - Muscle tone: good vs limp.
  - Movement: spontaneous, purposeful, symmetrical.
  - Obvious injuries, bleeding, bruising, impaled objects or gross deformities.
  - Assess for pain.
  - Determine weight - ask child or caretakers or use length / weight tape.

## Initial Assessment

- A. Airway Assessment and Maintenance with Spinal Motion Restriction
  - Maintainable with assistance: positioning.
  - Maintainable with adjuncts: oral airway, nasal airway.
  - Maintainable with endotracheal tube.
  - Listen for any audible airway noises, i.e., stridor, snoring, gurgling, wheezing.
  - Patency: suction secretions as necessary.
- B. Breathing
  - Rate and rhythm of respirations. Compare to normal rate for age and situation.
  - Chest expansion: symmetrical.
  - Breath sounds: compare both sides and listen for sounds (present, absent, normal, abnormal).
  - Positioning: sniffing position, tripod position.
  - Work of breathing: retractions, nasal flaring, accessory muscle use, head bobbing, grunting.

Protocol Continues 

# Universal Patient Care

## Initial Assessment (Continued)

### C. Circulation

- Heart rate: compare to normal rate for age and situation.
- Central / truncal pulses (brachial, femoral, carotid): strong, weak or absent.
- Distal / peripheral pulses: present / absent, thready, weak, strong.
- Color: pink, pale, flushed, cyanotic, mottled.
- Skin temperature: hot, warm, cool.
- Blood pressure: compare to normal for age of child. Must use appropriately sized cuff.
- Hydration status: anterior fontanel in infants, mucous membranes, skin turgor, crying tears, urine output history.

### D. Disability - Brief Neuro Examination

- Assess Responsiveness
  - A** Alert
  - V** Responds to verbal stimuli
  - P** Responds to painful stimuli
  - U** Unresponsive
- Assess pupils.
- Assess for transient numbness / tingling.

### E. Expose and Examine

- Expose the patient as appropriate based on age and severity of illness.
- Initiate measures to prevent heat loss and keep the child from becoming hypothermic.

## Focused History / Physical Assessment

Tailor assessment to the needs of the patient. Rapidly examine areas specific to the chief complaint.

### A. Patient History - Acquire during / incorporate into physical exam.

- S** **Signs & Symptoms** as they relate to the chief complaint.
- A** **Allergies** to medications, foods, environment
- M** **Medications:** prescribed, over-the-counter; compliance with prescribed dosing regimen; time, date and amount of last dose
- P** **Past Pertinent Medical History**
  - Pertinent medical or surgical problems
  - Preexisting diseases / chronic illness
  - Previous hospitalizations
  - Currently under medical care
  - For infants, obtain a neonatal history (gestation, prematurity, congenital anomalies, was infant discharged home at the same time as the mother)
- L** **Last oral intake** of liquid / food ingested.
- E** **Events surrounding current problem**
  - Onset, duration and precipitating factors
  - Associated factors such as toxic inhalants, drugs, alcohol
  - Injury scenario and mechanism of injury
  - Treatment given by caregiver

### B. Responsive Medical Patients

- Perform rapid assessment based on chief complaint. A full review of systems may not be necessary. If chief complaint is vague, examine all systems.

Protocol Continues 

# Universal Patient Care

## Focused History / Physical Assessment (Continued)

- C. Unresponsive Medical Patients
  - Perform rapid assessment: ABC's, quick head-to-toe exam.
  - Emergency care is based on signs and symptoms, initial impressions and standard operating procedures.
- D. Trauma patient with **NO** significant mechanism of injury.
  - Focused assessment is based on specific injury site.
- E. Trauma patient **WITH** significant mechanism of injury
  - Perform rapid assessment of all body systems.

## Detailed Assessment

- A. Performed to detect non-life threatening conditions and to provide care for those conditions / injuries. Usually performed enroute. May be performed on scene if transport is delayed.
  - Inspect and palpate each of the major body systems for the following:
    - ◇ Deformities
    - ◇ Contusions
    - ◇ Abrasions
    - ◇ Penetrations / punctures
    - ◇ Burns
    - ◇ Lacerations
    - ◇ Swelling / edema
    - ◇ Tenderness
    - ◇ Instability
    - ◇ Crepitus
  - Auscultation of breath and heart sounds as well as blood pressure readings may be required in the field.

## Ongoing Assessment

To effectively maintain awareness of changes in the patient's condition, repeated assessments are essential and should be performed **at least every 5 minutes on the unstable patient, and at least every 15 minutes on the stable patient.**

## Considerations for Children with Special HealthCare Needs (CSHCN)

- Track CSHCN in your service community and become familiar with both the child as well as their anticipated emergency care needs.
- Refer to child's emergency care plan formulated by their medical providers, if available. Understanding the child's baseline will assist in determining the significance of altered physical findings. Parents / caregivers are the best source of information on: medications, baseline vitals, functional level / normal mentation, likely medical complications, equipment operation and troubleshooting, emergency procedures.
- Regardless of underlying condition, assess in a systematic and thorough manner.
- Use parents / caregivers / home health nurses as medical resources at home and enroute.
- Be prepared for differences in airway anatomy, physical development, cognitive development and possibly existing surgical alterations or mechanical adjuncts. Common home therapies include: respiratory support (oxygen, apnea monitors, pulse oximeters, tracheostomies, mechanical ventilators), nutrition therapy (nasogastric or gastrostomy feeding tubes), intravenous therapy (central venous catheters), urinary catheterization or dialysis (continuous ambulatory peritoneal dialysis), ostomy care, orthotic devices, communication or mobility devices, or hospice care.
- Communicate with the child in an age appropriate manner. Maintain communication with and remain sensitive to the parents / caregivers and the child.
- The most common emergency encountered with these patients is respiratory related so familiarity with respiratory emergency interventions / adjuncts / treatment is appropriate.

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# Abuse and Maltreatment

## Definitions

**Abuse/Maltreatment:** Any act or series of acts of commission or omission by a caregiver or person in a position of power over the patient that results in harm, potential for harm, or threat of harm to a patient.

**Child Maltreatment/Abuse:** Child maltreatment includes any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child. An act of commission (child abuse) is the physical, sexual or emotional maltreatment or neglect of a child or children. An act of omission (child neglect) includes, but is not limited to, failure to provide for the child's needs (e.g. physical, emotional, medical / dental, and educational neglect) and failure to supervise (e.g. inadequate supervision or safety precautions, lack of appropriate car seat use, and exposure to violent or dangerous environments).

**Human Trafficking:** When people are abducted or coerced into service and often transported across international borders. Signs may include, but are not limited to: patient with branding / tattoos and environmental clues such as padlocks and/or doorknobs removed on interior doors, and intact windows that are boarded up.

*\*\*Per NASEMSO EMS Clinical Guidelines V 2.2*

## All Levels

### 1. UNIVERSAL PATIENT CARE.

2. Assessment and history; note any discrepancies in history, environment or interaction.
3. Address and treat any obvious injuries or life-threatening issues per the appropriate protocol.
4. Attempt to preserve evidence whenever possible; however, the overriding concern should be providing appropriate emergency care to the patient.
5. If no medical emergency exists, the next priority is safe patient disposition / removal from the potentially abusive situation. Call law enforcement for assistance.
6. Do not confront suspected perpetrators of abuse / maltreatment. This can create an unsafe situation for EMS and for the patient.
7. For patients transported, report concerns to receiving facility and to the appropriate agency / hotline.

**The Illinois EMS Act (210 ILCS 50/3.230) and The Illinois Abused and Neglected Child Reporting Act (325 ILCS 5/4) requires all licensed EMS providers to report suspected cases of child abuse or neglect. To report, call the Child Abuse hotline at 1-800-25-ABUSE.**

**The Illinois EMS Act (210 ILCS 50/3.230) and The Illinois Elder Abuse and Neglect Act (320 ILCS 20/4) requires all licensed EMS providers to report suspected cases of elder abuse or neglect. To report, call the Elder Abuse hotline at 1-866-800-1409. For Nursing Home abuse/neglect, call 1-800-252-4343.**

# Abuse and Maltreatment

## Illinois EMSC Special Considerations

1. You are required by law to report your suspicions.
2. Document findings objectively:
  - Body location of the injury
  - Severity of the injury
  - Patterns of similar injury over time
  - Include verbatim statements offered by the child
  - Note verbatim statements from the parent / caregiver
3. Suspect battered or abused child if any of the following is found:
  - A discrepancy exists between history of injury and physical exam
  - Caregiver provides a changing or inconsistent history
  - There is a prolonged interval between injury and the seeking of medical help
  - Child has a history of repeated trauma
  - Caregiver responds inappropriately or does not comply with medical advice
  - Suspicious injuries are present, such as:
    - ◊ injuries of soft tissue areas, including the face, neck and abdomen
    - ◊ injuries of body areas that are normally shielded, including the back and chest
    - ◊ fractures of long bones in children under 3 years of age
    - ◊ old scars, or injuries in different stages of healing
    - ◊ bizarre injuries, such as bites, cigarette burns, rope marks, imprint of belt or other object
    - ◊ trauma of genital or perianal areas
    - ◊ sharply demarcated burns in unusual areas
    - ◊ scalds that suggest child was dipped into hot water
4. The following are some common forms of neglect:
  - Environment is dangerous to the child (e.g., weapons within reach, playing near open windows without screen / guards, perilously unsanitary conditions, etc.)
  - Caretaker has not provided, or refuses to permit medical treatment of child's acute or chronic life-threatening illness, or of chronic illness, or fails to seek necessary and timely medical care for child
  - Child under the age of 10 has been left unattended or unsupervised. (Although in some situations children under 10 years of age may be left alone without endangerment, EMS personnel cannot make such determinations.) All instances should be reported for DCFS investigation
  - Abandonment
  - Caretaker appears to be incapacitated (e.g., extreme drug / alcohol intoxication, disabling psychiatric symptoms, severe illness) and cannot meet child's care requirements
  - Child appears inadequately fed (e.g., seriously underweight, emaciated, or dehydrated) inadequately clothed, or inadequately sheltered
  - Child is found to be intoxicated or under the influence of an illicit substance(s)

# Abuse and Maltreatment

## PEARLS

- Clues to abuse or maltreatment can vary with age group of the patient and type of abuse.
- Not all abuse or maltreatment is physical.
- EMS role is to:
  - a. Document concerns.
  - b. Assess potentially serious injuries.
  - c. Disclose concerns to appropriate authorities.
  - d. Initiate help to get the patient into a safe situation.
  - e. Not to investigate or intervene beyond the steps above.
  - f. Leave further intervention to law enforcement personnel.
- Potential clues to abuse / maltreatment from caregivers or general environment:
  - a. Caregiver apathy about patient's current situation.
  - b. Caregiver overreaction to questions about situation.
  - c. Inconsistent histories from caregivers or bystanders regarding what happened.
  - d. Information provided by caregivers or patient that is not consistent with injury patterns.
  - e. Injuries not appropriate for patient's age or physical abilities (e.g. infants with injuries usually associated with ambulatory children, elders who have limited mobility with injury mechanisms inconsistent with their capabilities).
  - f. Caregiver not allowing adult patient to speak for themselves, or who appears controlling – pay special attention to patients who cannot communicate due to young age or language and/or cultural barriers.
  - g. Inadequate safety precautions or facilities where the patient lives and/or evidence of security measures that appear to confine the patient inappropriately.
- Potential clues to abuse / maltreatment that can be obtained from the patient:
  - a. Multiple bruises in various stages of healing.
  - b. Age-inappropriate behavior (e.g. adults who are submissive or fearful, children who act in a sexually inappropriate way).
  - c. Pattern burns, bruises, or scars suggestive of specific weaponry used.
  - d. Evidence of medical neglect for injuries or infections.
  - e. Unexplained trauma to genitourinary systems or frequent infections to this system.
  - f. Evidence of malnourishment and/or serious dental problems.
- Have a high index of suspicion for abuse in children presenting with a Brief Resolved Unexplained Event (BRUE).

## KEY DOCUMENTATION ELEMENTS

- Meticulous documentation of any statements by the patient and/or parent / caregiver and any physical findings on the patient or the surroundings.
- Document findings by describing what you see (“2cm round burn to back”) and not ascribing possible causes (“burn consistent with cigarette”).
- Documentation of reporting suspected abuse to appropriate hotline.

## PERTINENT ASSESSMENT FINDINGS

- Identify potential life-threatening issues.
- Document thorough secondary survey to identify clues of potential abuse / maltreatment (See above)

## QUALITY METRICS

- Documentation of reporting suspected abuse.

# Abuse and Maltreatment

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# Airway Management

Transport to the closest appropriate hospital for airway stabilization when respiratory failure cannot be successfully managed in the prehospital setting.

## EMR & EMT-Basic

- UNIVERSAL PATIENT CARE**
  - Assess ABC's (Respiratory Rate, Effort, Adequacy)
  - Pulse Oximetry and EtCO<sub>2</sub> (if available)
- Establish airway patency
  - Open and maintain airway (i.e. head-tilt chin-lift or jaw thrust) with cervical spine precautions, per the SPINAL MOTION RESTRICTION Protocol
  - Suction as needed
  - Clear foreign body obstructions per the FOREIGN BODY AIRWAY OBSTRUCTION Protocol
- Administer **OXYGEN** with a target of achieving 94-98% saturation for most acutely ill patients.
- Consider inserting an oropharyngeal (OPA) or nasopharyngeal (NPA) airway adjunct as indicated.
  - OPA contraindicated with intact gag reflex.
  - NPA contraindicated in patients with known or suspected head injuries.
- Assist ventilations with a bag-valve-mask (BVM) and supplemental oxygen as needed.
  - Two-person, two-thumbs-up BVM ventilation is more effective than one-person technique and should be used when additional providers are available.
- If patient has a tracheostomy tube, refer to RESPIRATORY DISTRESS WITH A TRACHEOSTOMY TUBE / VENTILATOR Protocol.

## EMT-Intermediate & Paramedic

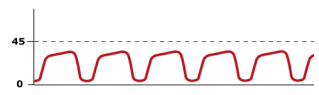

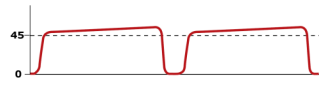
- Continue **EMR / BLS TREATMENT**.
- For apnea / respiratory failure or impending respiratory failure with impaired or absent gag reflex where BVM is not providing adequate ventilation consider a system approved BLIND INSERTION AIRWAY DEVICE (BIAD) (i.e. i-gel®).
- When less-invasive methods (BVM, BIAD) are ineffective, consider OROTRACHEAL INTUBATION\*\*.
  - Any intubation attempts in a pediatric patient should be considered a "difficult intubation" and any attempts should be made by the most experienced appropriately licensed provider.
  - EtCO<sub>2</sub> / waveform capnography is mandatory for all intubations.
  - Video laryngoscopy may enhance intubation success rates and should be used when available.
  - Limit of 2 total intubation attempts per patient.
    - Evaluate reason for failure and change technique or person attempting to increase chance of success.
- If successful intubation, perform post-intubation management procedures including:
  - Verification of proper placement with waveform capnography, absent gastric sounds, and bilateral breath sounds.
  - Note the centimeter marking of the ET tube adjacent to the teeth or lips.
  - Secure the ET tube with a commercial device or tape.
- Ventilate with minimal volume in order to see chest rise, approximately 6-7 mL/kg Ideal Body Weight.
  - Avoid hyperventilation. Maintain EtCO<sub>2</sub> of 35-45 mmHg
- Continuously monitor placement with waveform capnography during treatment and transport.

**\*\*Prehospital endotracheal intubation of children ≤ 8 years old has not shown benefit, and may cause harm. Intubation should ONLY be considered if you are still unable to oxygenate or ventilate utilizing BVM, OPA, NPA or BIAD.**

# Airway Management

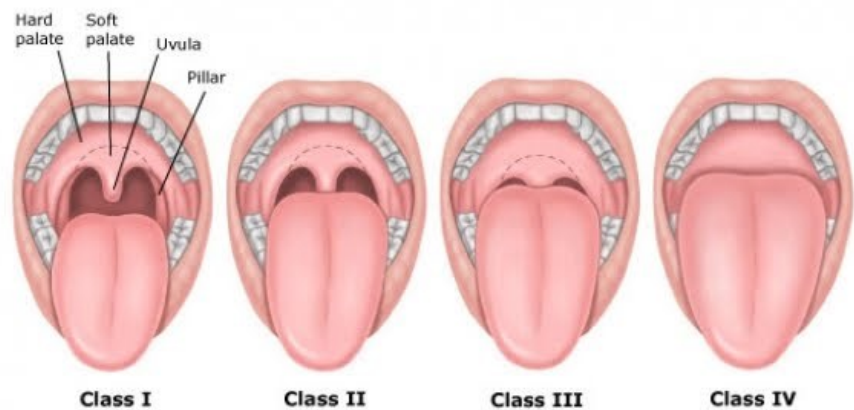
Normal Pediatric Vital Signs			
Age	Pulse	Systolic BP	Respiratory Rate
Neonate (0-1 mo)	100-180	>60	30-60
Infant (1-12 mo)	100-160	>70	30-60
Toddler (1-3 yrs)	90-150	>70 + (age in yrs x 2)	24-40
Pre-School (3-5 yrs)	80-140	>70 + (age in yrs x 2)	22-34
School Age (5-12 yrs)	70-120	>70 + (age in yrs x 2)	18-30
Adolescent (12-18 yrs)	60-100	>90	12-20

\*\*Created based off of Illinois EMSC Guidelines

EtCO <sub>2</sub>		
Value	Waveform	State of ventilation
Less than 35 mmHg Hypocapnia		Hyperventilation. Consider slowing ventilator rate
35 - 45 mmHg Normal		Usually indicates adequate ventilation
Greater than 45 mmHg Hypercapnia		Hypoventilation. Consider increasing ventilator rate, assess adjunct for occlusion

## Mallampati Classification

- **Class 1:** Full visibility of tonsils, uvula and soft palate
- **Class 2:** Visibility of hard and soft palate, upper portion of tonsils and uvula
- **Class 3:** Soft and hard palate and base of the uvula are visible (*predicted difficult*)
- **Class 4:** Only Hard Palate visible (*predicted difficult*)



# Airway Management

## PEARLS

- Avoid excessive pressures or volumes during BVM. Ventilate with minimal volume to see chest rise, approximately 6-7 mL/kg ideal body weight
- Avoid endotracheal intubation, unless less invasive methods fail, since it can be associated with aspiration, oral trauma, worsening of cervical spine injury, malposition of the ET tube (right mainstem intubation, esophageal intubation), or adverse effects of sedation, especially in children.
- An *Intubation Attempt* is defined as passing the laryngoscope blade past the teeth.
- **Bag-Valve-Mask (BVM):** Appropriately-sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin
  - a. Ventilation should be delivered with only sufficient volume to achieve chest rise
  - b. Ventilation rate:
    - i. During CPR with an advanced airway, ventilation rate should be 10 breaths per minute, one breath every 10 compressions (or one breath every 6 seconds). Ideally ventilations should be on the upstroke between two chest compressions.
    - ii. In adults who are not in cardiac arrest, ventilate at rate of 12 breaths per minute.
    - iii. In children who are not in cardiac arrest, ventilating breaths should be delivered over one second, with a two second pause between breaths (20 breaths/minute).
- **Orotracheal intubation:**
  - a. Approximate depth of insertion = (3) x (endotracheal tube size).
  - b. In addition to preoxygenation, apneic oxygenation (high-flow oxygen by nasal cannula) may prolong the period before hypoxia during an intubation attempt.
  - c. Appropriate attention should be paid to adequate preoxygenation to avoid peri-intubation hypoxia and subsequent cardiac arrest.
  - d. Prompt suctioning of soiled airways before intubation attempt may improve first pass success.
  - e. Confirm successful placement with waveform capnography. Less optimal methods of confirmation include bilateral chest rise, bilateral breath sounds, and maintenance of adequate oxygenation. Color change on EtCO<sub>2</sub> is less accurate than clinical assessment, and wave-form capnography is superior. Misting observed in the tube is not a reliable method of confirmation. Visualization with video laryngoscopy, when available, may assist in confirming placement when unclear due to capnography failure or conflicting information.

## KEY DOCUMENTATION ELEMENTS

- Initial vitals signs and physical exam
- Size of equipment used
- Number of intubation attempts
- Reassessment with repeat vital signs
- Document EtCO<sub>2</sub> value and record capnography wave initially after intubation, with each set of vital signs, when patient is moved and at the time of patient transfer in the ED

## PERTINENT ASSESSMENT FINDINGS

- Complete respiratory and airway assessment
- Ongoing assessment is critical when an airway device is in place
- Acute worsening of respiratory status or evidence of hypoxemia can be secondary to displacement or obstruction of the airway device, pneumothorax or equipment failure

## QUALITY METRICS

- First pass intubation success rate
- Documentation of post-intubation confirmation (EtCO<sub>2</sub>, absent gastric sounds, bilateral breath sounds)
- Waveform capnography used for initial confirmation and continuous monitoring during transport with advanced airway

# Airway Management

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# Determination of Death / Withholding Resuscitative Efforts

All clinically dead patients will receive all available resuscitative efforts including cardiopulmonary resuscitation (CPR) unless contraindicated by one of the exceptions defined below.

## All Levels

1. A person is presumed *Dead on Arrival* (DOA) when all “signs of death” are present and at least one associated “factor of death” is present.

<b>SIGNS OF DEATH</b> <b>(ALL must be present)</b>	<b>FACTORS OF DEATH</b> <b>(At least one must be present)</b>
<ul style="list-style-type: none"> <li>• Unresponsiveness</li> <li>• Apnea</li> <li>• Pulseless (carotid &amp; femoral by 2 providers)</li> <li>• No obvious signs of life (<i>spontaneous movement, ECG activity or AED shockable rhythm, or pupillary response</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• Lividity</li> <li>• Rigor mortis</li> <li>• Decapitation</li> <li>• Decomposition</li> <li>• Transection of the torso</li> <li>• Incineration</li> <li>• Injuries incompatible with life:                             <ul style="list-style-type: none"> <li>- massive crush injury</li> <li>- complete exsanguination</li> <li>- severe displacement of brain matter</li> </ul> </li> <li>• Massive blunt or penetrating trauma</li> </ul>

2. Do not initiate resuscitation in the following:
  - Do Not Resuscitate orders:** No resuscitation efforts should be initiated when the person or family has evidence of a valid Do Not Resuscitate (DNR) order in hand.
  - Scene safety:** The physical environment is not safe for the EMS providers to enter.
3. Pediatric Considerations:
  - Infant death (SIDS):** An infant who is apneic and meets the above criteria may be presumed dead.
  - Neonatal death:** A neonate who is apneic, pulseless, and exhibits neonatal maceration (softening or degeneration of the tissues after death in utero), anencephaly (absence of a major portion of the brain, skull, and scalp) may be presumed dead.
4. If any of the findings are different than those described above, clinical death is not confirmed and resuscitative measures should be immediately initiated or continued.
5. Contact **MEDICAL CONTROL** to confirm death.
6. Once death confirmation has been made by medical control and resuscitation will not be attempted:
  - a. Immediately notify the coroner or medical examiner’s office.
  - b. Do NOT leave a body unattended. EMS should remain on scene until the coroner arrives or law enforcement is on scene.
  - c. Do NOT remove any property from the body or the scene.
  - d. Never transport / move a body without permission from the coroner's office except for assessment or its protection.

# Determination of Death / Withholding Resuscitative Efforts

## PEARLS

- In cases where the patient's status is unclear and the appropriateness of withholding resuscitation efforts is questioned, EMS personnel should initiate CPR immediately and then contact direct medical oversight.
- For scene safety and/or family wishes, provider may decide to implement CPR even if all the criteria for death are met.
- At a likely crime scene, disturb as little potential evidence as possible.
- Medical cause or traumatic injury or body condition clearly indicating biological death (irreversible brain death), limited to:
  - a. Decapitation: the complete severing of the head from the remainder of the patient's body.
  - b. Decomposition or putrefaction: the skin is bloated or ruptured, with or without soft tissue sloughed off. The presence of at least one of these signs indicated death occurred at least 24 hours previously.
  - c. Transection of the torso: the body is completely cut across below the shoulders and above the hips through all major organs and vessels. The spinal column may or may not be severed.
  - d. Incineration: 90% of body surface area with full thickness burns as exhibited by ash rather than clothing and complete absence of body hair with charred skin.
  - e. Injuries incompatible with life (such as massive crush injury, complete exsanguination, severe displacement of brain matter).
  - f. In blunt and penetrating trauma, if the patient is apneic, pulseless, and without other signs of life upon EMS arrival including, but not limited to spontaneous movement, ECG activity, or pupillary response.

## KEY DOCUMENTATION ELEMENTS

- Clinical / situational details that may be available from bystanders / caregivers
- Documentation of details surrounding decision to determine death
  - Signs / Factors of death
  - Time of contact with Medical Control
  - Time of death confirmation
  - Name of Physician giving death confirmation

## PERTINENT ASSESSMENT FINDINGS

- Signs of death
- Factors of death

## QUALITY METRICS

- Documentation of details surrounding determination of death and time of death confirmation

# Functional Needs / Special Needs Populations

## Criteria

Patients who are identified by the World Health Organization's International Classification of Functioning, Disability, and Health that have experienced a decrement in health resulting in some degree of disability. According to the U.S. Department of Health and Human Services, this includes, but is not limited to, individuals with physical, sensory, mental health, and cognitive and/or intellectual disabilities affecting their ability to function independently without assistance.

## All Levels

1. Identify the functional need by means of information from the patient, the patient's family, bystanders, medic alert bracelets or documents, or the patient's adjunct assistance devices.
2. The physical examination should not be intentionally abbreviated, although the manner in which the exam is performed may need to be modified to accommodate the specific needs of the patient.
3. Medical care should not intentionally be reduced or abbreviated during the triage, treatment, and transport of patients with functional needs, although the manner in which the care is provided may need to be modified to accommodate the specific needs of the patient.
4. For patients with communication barriers (language or sensory), it may be desirable to obtain secondary confirmation of pertinent data (e.g. allergies) from the patient's family, interpreters, or written or electronic medical records. The family members can be an excellent source of information and the presence of a family member can have a calming influence on some of these patients.

Assistance Adjuncts. Examples of devices that facilitate the activities of daily living for the patient with functional needs include, but are not limited to:

- a. Extremity prostheses
- b. Hearing aids
- c. Magnifiers
- d. Tracheostomy speaking valves
- e. White or sensory canes
- f. Wheelchairs or motorized scooters

Service Animals - As defined by the American Disabilities Act, "any guide dog, signal dog, or other animal individually trained to do work or perform tasks for the benefit of an individual with a disability, including, but not limited to guiding individuals with impaired vision, alerting individuals with impaired hearing to intruders or sounds, providing minimal protection or rescue work, pulling a wheelchair, or fetching dropped items."

- a. Services animals are not classified as a pet and should, by law, always be permitted to accompany the patient.

# Functional Needs / Special Needs Populations

## PEARLS

- Communication Barriers:
  - a. Language Barriers:
    - i. Expressive and/or receptive aphasia
    - ii. Nonverbal
    - iii. Fluency in a different language than that of the EMS professional
    - iv. Examples of tools to overcome language barriers include:
      1. Transport of an individual who is fluent in the patient's language along with the patient to the hospital
      2. Medical translation cards
      3. Telephone-accessible services with live language interpreters
      4. Methods through which the patient augments his / her communication skills (e.g. eye blinking, nodding) should be noted, utilized as able, and communicated to the receiving facility
      5. Electronic applications for translation
  - b. Sensory Barriers:
    - i. Visual impairment
    - ii. Auditory impairment
    - iii. Examples of tools to overcome sensory barriers include:
      1. Braille communication card
      2. Sign language
      3. Lip reading
      4. Hearing aids
      5. Written communication
- Physical Barriers:
  - a. Ambulatory impairment (e.g. limb amputation, bariatric)
  - b. Neuromuscular impairment
- Cognitive Barriers:
  - a. Mental illness
  - b. Developmental challenge or delay

## KEY DOCUMENTATION ELEMENTS

- Document all barriers of care
- Document specific physical barriers in the appropriate exam elements
- Document any language or sensory barriers and assistance adjuncts

## PERTINENT ASSESSMENT FINDINGS

- Barriers (*see above*)

## QUALITY METRICS

- Documentation of barriers of care.



# Intercept Criteria

## Criteria

The appropriate ALS vehicle will be dispatched to intercept with a BLS or ILS unit / team when:

1. The BLS or ILS unit or team requests intercept or;
2. The ECRN or MD at the receiving hospital deems it necessary based upon the condition of the patient or;
3. The patient meets one or more of the following (including but not limited to):

### BLS Intercept Criteria:

- a. Active seizures
- b. Anaphylaxis
- c. Cardiopulmonary Arrest
- d. Chest Pain (Acute Coronary Syndrome)
- e. Diabetic Emergencies
- f. Drowning / Near drowning
- g. Electrical injuries (High or Low)
- h. Obstetrical emergencies (i.e. prolapsed cord, abnormal presentations)
- i. Obstructed airways that cannot be cleared
- j. Respiratory Arrest / Distress
- k. Severe traumatic injuries
- l. Signs / symptoms of shock (i.e. tachycardia, tachypnea, abnormal skin signs, hypotension)
- m. Symptomatic overdose or poisoning
- n. Any patient situation that higher level of care may benefit the patient

### ILS Intercept Criteria:

- a. Cardiogenic shock
  - b. Obstructed airways that cannot be cleared
  - c. Cardiac tamponade
  - d. Severe traumatic injuries
  - e. Symptomatic overdose or poisoning
  - f. Any patient situation that higher level of care may benefit the patient
4. The decision to utilize an intercept may be influence by various factors such as:
    - a. Geographical location
    - b. Improvement of patient condition
    - c. Refusal of higher level of care by patient with appropriate documentation

# Intercept Criteria

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# Pain Management

## History

- Age
- Location
- Duration
- Severity (1-10)
- Past medical history
- Medications
- Drug allergies

## Signs and Symptoms

- Severity (pain scale)
- Quality (sharp, dull, etc.)
- Radiation
- Relation to movement / respiration
- Increased with palpation to area

## Differential

- Per the specified protocol
- Musculoskeletal
- Visceral (abdominal)
- Cardiac
- Pleural / Respiratory
- Neurogenic
- Renal (colic)

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Determine pain score and continue to monitor / trend score.
3. Place patient in a position of comfort.
4. Apply ice packs and/or splints for pain secondary to trauma.
5. Verbally reassure patient to control anxiety.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Determine pain score and continue to monitor / trend score.
3. **MORPHINE SULFATE 0.1 mg/kg IV/IO/IM** (max 10mg). May repeat IV/IO dose x 1 after 15 minutes if needed.  
-OR-  
**FENTANYL 1 mcg/kg IV/IO/IM/IN** (max initial dose 100 mcg); May repeat x 1 after 10-15 minutes at 0.5 mcg/kg (maximum second dose 50 mcg).
  - a. IV/IO is a slow push over 2-3 minutes.
4. Continuous monitoring of patient with cardiac monitor, continuous SpO2 and capnography is required.



# Patient Refusal

## Criteria

- Patient refuses treatment, transport or requests transport to facility other than closest, most appropriate facility.
- Patient is > 18 years old, or an emancipated minor.
- Patient is < 18 years old, and one of the following:
  - a. Legal guardian is present.
  - b. Legal guardian contacted from the scene and consents to refusal.
- Patient or legal guardian is competent and has the mental capacity to make an informed decision.
  - a. Patient is alert, oriented and has the ability to understand the circumstances surrounding his / her illness or impairment, as well as the possible risks associated with refusing treatment and/or transport.
  - b. The individual's judgement must also not be significantly impaired by illness, injury or drugs / alcohol intoxication.
  - c. The "Quick Confusion Scale" was administered and patient received a score of greater than 11.
- Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having decision-making capacity and may not decline transport to a medical facility.

## All Levels

1. Ensure all refusal criteria are met in accordance with the "Refusal of Service" Policy.
2. Obtain a complete set of vital signs and complete an initial assessment, paying particular attention to the individual's neurologic and mental status.
3. Determine the individual's capacity to make a valid judgement concerning the extent of his / her illness or injury. Utilize the "Quick Confusion Scale" to help make determination of patients capacity. If the EMS provider has doubts about whether the individual has the mental capacity to refuse or if the patient lacks capacity, the EMS provider should contact Medical Control
4. Ask patient or guardian to explain reasons for refusal.
5. Clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care.
6. If patient or guardian does not demonstrate understanding risks of refusal, initiate care under implied consent.
7. If refusal represents a significant risk to the patient, based upon mechanism of injury or severity of illness, contact Medical Control for advice.
8. Perform appropriate medical care with consent of the individual.
9. If all criteria are met for refusal and risks of refusal have been explained, with reasonable understanding demonstrated by patient or guardian, refusal can be accepted and patient or guardian should sign refusal form.
10. If patient or guardian is unable or unwilling to sign, document circumstances.
11. Contact Medical Control as necessary.
12. Complete the patient care report clearly documenting the initial assessment findings and the discussions with all involved individuals regarding the possible consequences of refusing additional prehospital care and/or transportation.

Protocol Continues

# Patient Refusal

## Special Considerations for Minors

- It is preferable for minors to have a parent or legal guardian who can provide consent for treatment on behalf of the child
- All states allow healthcare providers to provide emergency treatment when a parent is not available to provide consent. This is known as the emergency exception rule or the doctrine of implied consent. For minors, this doctrine means that the prehospital professional can presume consent and proceed with appropriate treatment and transport if the following four conditions are met:
  - a. The child is suffering from an emergent condition that places his or her life or health in danger.
  - b. The child's legal guardian is unavailable or unable to provide consent for treatment or transport.
  - c. Treatment or transport cannot be safely delayed until consent can be obtained.
  - d. The prehospital professional administers only treatment for emergency conditions that pose an immediate threat to the child.
  - e. As a general rule, when the prehospital professional's authority to act is in doubt, EMS providers should always do what they believe to be in the best interest of the minor.
  - f. If a minor is injured or ill and no parent contact is possible, the provider may contact Medical Control for additional instructions.

# Patient Refusal

## PEARLS

- Refer to the “*Refusal of Service*” Policy.
- An adult or emancipated minor who has demonstrated possessing sufficient mental capacity for making decisions has the right to determine the course of his / her medical care, including the refusal of care. These individuals must be advised of the risks and consequences resulting from refusal of medical care.
- An individual determined to lack decision-making capacity by EMS providers should not be allowed to refuse care against medical advice or to be released at the scene. Mental illness, drugs, alcohol intoxication, or physical / mental impairment may significantly impair an individual’s decision-making capacity. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having demonstrated sufficient decision-making capacity.
- The determination of decision-making capacity may be challenged by communication barriers or cultural differences.
- EMS providers should not put themselves in danger by attempting to treat and/or transport an individual who refuses care.
- Always act in the best interest of the patient – EMS providers, with the support of direct medical oversight, must strike a balance between abandoning the patient and forcing care.

## KEY DOCUMENTATION ELEMENTS

- Document patient capacity with:
  - Any and all barriers to patient care
  - Physical Exam
  - Mental Status / Neuro Exam (AVPU & GCS)
  - Quick Confusion Scale
  - Alcohol and drug use indicators
  - Blood glucose level
- Any assessments and treatments performed
- Patient age
- For minors: guardian name, contact and relationship
- Patient was advised of risks / benefits of refusal / treatment
- Patient voices understanding of risks of refusal
- Patient was advised that they can change their mind and re-contact EMS at anytime
- Reason for patient refusing care. A quotation of the patient’s actual words is best.
- Medical Control Contact

## PERTINENT ASSESSMENT FINDINGS

- Decision-Making Capacity
  - a. An individual who is alert, oriented, and has the ability to understand the circumstances surrounding his / her illness or impairment, as well as the possible risks associated with refusing treatment and/or transport, typically is considered to have decision-making capacity.
  - b. The individual’s judgment must also not be significantly impaired by illness, injury or drugs / alcohol intoxication. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having decision-making capacity and may not decline transport to a medical facility.
- Quick Confusion Scale (if applicable)

## QUALITY METRICS

- Patient decision-making capacity was determined and documented
- Guardians contacted or efforts to contact the guardians for minor patients who are not or cannot be confirmed to be emancipated

# Patient Refusal

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# Radio Report

## All Levels

1. Unit must identify call letters, level of service and city of origin.
  - a. Non-transport agencies may use MERCI, local radio frequency or cellular phone to communicate with Medical Control.
  - b. Report should be called to receiving facility on all transports.
2. Standard report:
  - a. ETA
  - b. Age and sex
  - c. Mechanism of injury / Nature of illness
  - d. Pertinent findings
  - e. Vital Signs
  - f. Patient care / interventions
3. Orders must be confirmed when received from Medical Control by repeating them verbatim back to Medical Control for verification and clearly documented in the patient care report.
4. In the event of communications system failure, protocols may be used as listed, including Medical Control considerations. Protocol usage must be documented by risk screen and submitted to EMS system office within 24 hours.
5. In the event that a provider deviates from these protocols, a completed risk screen with written explanation must be completed and submitted to the EMS Medical Director within 24 hours of the occurrence.

# Radio Report

## PEARLS

- Radio communications is a vital component of prehospital care. Information reported should be concise and provide an accurate description of the patient's condition as well as treatment rendered.
- Early and timely notification of Medical Control or the receiving facility is essential for prompt care to be delivered by all involved.
- Whenever possible, the EMS provider responsible for the highest level of direct patient care should call in the report.

## KEY DOCUMENTATION ELEMENTS

- Document report given to receiving hospital
- Document any orders given verbatim as well as name of ordering physician

## PERTINENT ASSESSMENT FINDINGS

## QUALITY METRICS

# Abdominal Pain

## History

- Age
- Past Medical / Surgical History
- Medications
- Onset
- Palliation / Provocation
- Quality (crampy, constant, sharp, dull, etc.)
- Region / Radiation / Referred
- Severity (0-10)
- Time (duration / repetition)
- Fever
- Last oral intake
- Last bowel movement / Emesis
- Menstrual history (pregnancy)

## Signs and Symptoms

- Pain (location / migration)
- Tenderness
- Nausea
- Vomiting
- Diarrhea
- Dysuria
- Constipation
- Vaginal bleeding / discharge
- Pregnancy

## Differential

- Pneumonia or pulmonary embolus
- Liver (hepatitis, CHF)
- Peptic Ulcer Disease / Gastritis
- Gallbladder
- Myocardial Infarction
- Pancreatitis
- Kidney stone
- Abdominal Aortic Aneurysm
- Appendicitis
- Bladder / Prostate disorder
- Pelvic (PIC, Ectopic pregnancy, Ovarian cyst)
- Splenomegaly
- Diverticulitis
- Bowel obstruction
- Gastroenteritis (infectious)

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Maintain the patient NPO (nothing by mouth).
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue EMR / BLS TREATMENT.
2. Establish IV access.
3. Consider management of nausea/vomiting per the NAUSEA / VOMITING Protocol.
4. Consider management of pain per the PAIN MANAGEMENT Protocol.
5. If signs of shock refer to SHOCK Protocol.

# Abdominal Pain

## PEARLS

- Assess for life-threatening causes of abdominal pain, which may include:

### Ischemic, necrotic, or perforated bowel

- ◇ Severe tenderness
- ◇ Abdominal pain with motion or “jiggling” of abdomen
- ◇ Fever
- ◇ Bloody stool
- ◇ Nausea and vomiting
- ◇ Possible absence of passage of stool or gas
- ◇ Abdominal distention, with possible tympany to percussion

### Ruptured ectopic pregnancy

- ◇ Vaginal bleeding
- ◇ Recently diagnosed pregnancy

### Appendicitis

- ◇ Focal right lower quadrant tenderness
- ◇ RLQ tenderness during palpation of LLQ (Rovsing’s sign)
- ◇ Peri-umbilical or diffuse abdominal tenderness with palpation or “jiggling” of the abdomen/pelvis
- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Lack of appetite

### Acute Cholecystitis

- ◇ Right upper quadrant or epigastric tenderness
- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Possible history of gallstones

### Pyelonephritis

- ◇ Fever
- ◇ Nausea, vomiting
- ◇ Urinary frequency / urgency
- ◇ Dysuria
- ◇ Hematuria
- ◇ Back / Flank pain
- ◇ Costovertebral angle tenderness to percussion

## KEY DOCUMENTATION ELEMENTS

- Assessment of abdomen to include findings on palpation / percussion including presence or absence of masses and presence and nature of tenderness / pain
- Treatment and response to treatment

## PERTINENT ASSESSMENT FINDINGS

- Rebound tenderness or guarding
- Abdominal distention
- Tenderness focal to a specific abdominal quadrant
- Presence of “pulsatile” abdominal mass
- Rectal bleeding, hematemesis, vaginal bleeding

## QUALITY METRICS

- Assessment for life-threatening etiology
- Treatment of pain per the Pain Management Protocol as indicated.

# Agitated or Violent Patient / Behavioral Emergencies

## History

- Situational crisis
- Psychiatric illness / medications
- Injury to self or threats to others
- Medic alert tag
- Substance abuse / overdose
- Diabetes

## Signs and Symptoms

- Anxiety, agitation, confusion
- Affect change, hallucinations
- Delusional thoughts, bizarre behavior
- Combative / Violent
- Expression of suicidal / homicidal thoughts

## Differential

- See Altered Mental Status differential
- Alcohol intoxication
- Toxin / Substance abuse
- Medication effect / overdose
- Withdrawal syndromes
- Depression / Anxiety disorders
- Bipolar (manic-depressive)
- Schizophrenia
- Seizure / Postictal

## EMR, EMT-Basic & EMT-Intermediate

### 1. UNIVERSAL PATIENT CARE.

- a. Maintain and support airway.
- b. Note respiratory rate and effort—If possible, monitor pulse oximetry and/or capnography.
- c. Check blood glucose level.

### 2. Note medications / substances on scene that may contribute to the agitation or may be relevant to the treatment of a contributing medical condition.

### 3. If a medical or traumatic condition is suspected as the cause of the behavior, refer to the appropriate protocol.

### 4. Establish patient rapport

- a. Attempt verbal reassurance and calm patient prior to use of pharmacologic and/or physical management devices.
- b. Engage family members / loved ones to encourage patient cooperation if their presence does not exacerbate the patient's agitation.
- c. Continued verbal reassurance and calming of patient following use of chemical / physical management devices.

### 5. Physical Management Devices (*See PATIENT RESTRAINTS Procedure*)

- a. Patient must be out of control and a threat to themselves and/or others.
- b. If physical restraint is required, make sure adequate personnel are present. This generally means four people, one for each of the patient's extremities.
- c. Stretcher straps should be applied as the standard procedure for all patients during transport.
- d. Secure all four extremities to the stationary frame of the stretcher if needed.
- e. Physical management devices, including stretcher straps, should never restrict the patient's chest wall motion.

### 6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## Paramedic

### 1. Continue **EMR / BLS / ILS TREATMENT**.

### 2. Sedate patient as necessary based on patient's presentation and potential for self-harm. Contact medical control prior to sedation if questions / concerns exist regarding care.

### 3. Administer **MIDAZOLAM IV/IM/IN: 0.1 mg/kg**; (maximum dose 5 mg) *Onset: IV: 3-5 min; IM: 10-15 min; IN: 3-5 min*

### 4. If sedation is used, continuous cardiac, pulse oximetry and EtCO<sub>2</sub> monitoring and vital signs every 5 minutes are required.

# Agitated or Violent Patient / Behavioral Emergencies

## Patient Safety Considerations

The management of violent patients requires a constant reevaluation of the risk / benefit balance for the patient and bystanders in order to provide the safest care for all involved. These are complex and high-risk encounters. There is no one size fits all solution for addressing these patients.

1. Don PPE.
2. Do not attempt to enter or control a scene where physical violence or weapons are present.
3. Dispatch law enforcement immediately to secure and maintain scene safety.
4. Urgent de-escalation of patient agitation is imperative in the interest of patient safety as well as for EMS personnel and others on scene.
5. Uncontrolled or poorly controlled patient agitation and physical violence can place the patient at risk for sudden cardiopulmonary arrest due to the following etiologies:
  - a. Excited delirium / exhaustive mania: A postmortem diagnosis of exclusion for sudden death thought to result from metabolic acidosis (most likely from lactate) stemming from physical agitation or physical control measures and potentially exacerbated by stimulant drugs (e.g. cocaine) or alcohol withdrawal.
  - b. Positional asphyxia: Sudden death from restriction of chest wall movement and/or obstruction of the airway secondary to restricted head or neck positioning resulting in hypercarbia and/or hypoxia.
6. Apply a cardiac monitor as soon as possible, particularly when pharmacologic management medications have been administered.
7. All patients who have received pharmacologic management medications must be monitored closely for the development of hypoventilation and oversedation.
  - a. Must utilize capnography
8. Placement of stretcher in sitting position prevents aspiration and reduces the patient's physical strength by placing the abdominal muscles in the flexed position.
9. Patients who are more physically uncooperative should be physically secured with one arm above the head and the other arm below the waist, and both lower extremities individually secured.
10. The following techniques should be expressly prohibited by EMS providers:
  - a. Secure or transport in a prone position with or without hands and feet behind the back (hobbling or "hog-tying").
  - b. "Sandwiching" patients between backboards.
  - c. Techniques that constrict the neck or compromise the airway.
  - d. EMS provider use of weapons as adjuncts in managing a patient.

# Agitated or Violent Patient / Behavioral Emergencies

## PEARLS

- Direct medical oversight should be contacted at any time for advice, especially when patient's level of agitation is such that transport may place all parties at risk.
- Stretchers with adequate foam padding, particularly around the head, facilitates patient's ability to self-position the head and neck to maintain airway patency.
- For patients with key-locking devices, applied by another agency, consider the following options:
  - a. Remove device and replace it with a device that does not require a key.
  - b. Administer pharmacologic management medication then remove and replace device with another non-key-locking device after patient has become more cooperative.
  - c. Transport patient, accompanied in patient compartment by person who has device key.

### Use SAFER model:

**S**tabilize the situation by containing and lowering the stimuli (remove unnecessary personnel, remove patient from stress, reassure, calm and establish rapport.) Keep hands in front of your body (non-threatening posture.) Only one provider should communicate with patient. Outline the patient's choices and calmly set some boundaries of acceptable behavior.

**A**ssess and acknowledge crisis by validating patient's feelings and not minimizing them.

**F**acilitate resources (Friends, family, police, chaplain).

**E**ncourage patient to use resources available and take actions in their best interest.

**R**ecovery or referral: Leave patient in care of responsible person, professional or transport to medical facility.

## KEY DOCUMENTATION ELEMENTS

- Etiology of agitated or violent behavior if known
- Patient's medications, other medications or substances found on scene
- Patient's medical history
- Physical evidence or history of trauma
- Adequate oxygenation by pulse oximetry
- Blood glucose measurement
- Measures taken to establish patient rapport
- Dose, route, number of doses and response of medications administered
- Number and physical sites of placement of restraints
- Duration of placement of restraints
- Repeated assessment of ABC's

## PERTINENT ASSESSMENT FINDINGS

- Continuous monitoring of:
  - a. Airway patency
  - b. Respiratory status with pulse oximetry and/or capnography
  - c. Circulatory status with frequent blood pressure measurements
  - d. Mental status and trends in level of patient cooperation
  - e. Cardiac status, especially if the patient has received pharmacologic management medication
  - f. Extremity perfusion with capillary refill in patients in physical management device

## QUALITY METRICS

- Incident of injuries to patient, EMS personnel or others on scene or during transport
- Medical or physical complications (including sudden death) in patients
- Documentation of estimated weight in kilograms

# Agitated or Violent Patient / Behavioral Emergencies

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# Allergic Reaction / Anaphylaxis

## History

- Onset and location
- Insect sting or bite
- Food allergy / exposure
- Medication allergy / exposure
- New clothing, soap, detergent
- Past history of reactions
- Past medication history

## Signs and Symptoms

- Itching or urticaria
- Coughing, wheezing, or respiratory distress
- Chest tightness or throat constriction
- Hypotension or shock
- Persistent gastrointestinal symptoms (nausea, vomiting, and diarrhea)
- Altered mental status

## Differential

- Angioedema (drug induced)
- Aspiration / Airway obstruction
- Vasovagal Event
- Asthma / Reactive Airway Disease

## EMR

1. **UNIVERSAL PATIENT CARE**
2. If signs of anaphylaxis, administer and/or assist patient with **EPINEPHRINE AUTOINJECTOR** if available.
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT**.
2. If signs of anaphylaxis, administer **EPINEPHRINE (1:1,000) 0.15 mg IM** (less than 30 kg) or **0.3 mg IM** (30kg and over).
3. **DuoNeb** nebulizer for wheezing. May repeat x2 if needed for continued symptomatic relief.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT**.
2. If signs of anaphylaxis persist, repeat **EPINEPHRINE (1:1,000) 0.01 mg/kg IM** (max single dose 0.3 mg). May repeat every 5-15 minutes. (Max 3 total doses)
3. Establish IV access.
4. **DIPHENHYDRAMINE 1 mg/kg IM/IV/IO** (Max dose 50 mg).
5. **METHYLPREDNISOLONE 2 mg/kg IV/IM** (Maximum dose 125 mg).
6. For signs of hypoperfusion, administer **NORMAL SALINE 20 mL/kg**. Repeat as needed for ongoing hypoperfusion to a maximum of 60 mL/kg.
7. Closely monitor respiratory status with waveform capnography and reassess need for intubation if respiratory symptoms worsen or do not improve with treatment. See AIRWAY MANAGEMENT Protocol.

# Allergic Reaction / Anaphylaxis

## PEARLS

- Allergic reactions and anaphylaxis are serious and potentially life-threatening medical emergencies.
- The shorter the onset from exposure to symptoms, the more severe the reaction.
- Localized allergic reactions (e.g. urticarial or angioedema that does not compromise the airway) may be treated with antihistamine therapy.
- Anaphylaxis should always be treated with Epinephrine as first-line treatment.
- Cardiovascular collapse may occur abruptly, without the prior development of skin or respiratory symptoms.
- Always perform cardiac monitoring when administering Epinephrine
  - Cardiac monitoring should not delay administration of Epinephrine

## Severity

- **Anaphylaxis**—More severe and characterized by an acute onset involving:
  - 1) Skin (urticaria) and/or mucosa with either respiratory compromise or hypotension or signs of end-organ dysfunction **-OR-**
  - 2) Hypotension for that patient after exposure to a known allergen **-OR-**
  - 3) Two or more of the following occurring rapidly after exposure to a likely allergen:
    - i. Skin and/or mucosal involvement (urticaria, itchy, swollen tongue / lips)
    - ii. Respiratory compromise (dyspnea, wheeze, stridor, hypoxemia)
    - iii. Persistent gastrointestinal symptoms (vomiting, abdominal pain, diarrhea)
    - iv. Hypotension or associated symptoms (syncope, hypotonia, incontinence)
- **Non-Anaphylactic Allergic Reaction**—Signs involving only one organ system (e.g. localized angioedema that does not compromise the airway or not associated with vomiting; urticaria alone).

## KEY DOCUMENTATION ELEMENTS

- Medications given
- Dose and concentration of Epinephrine given
- Route of Epinephrine administration
- Time of Epinephrine administration
- Signs and symptoms of the patient

## PERTINENT ASSESSMENT FINDINGS

- Presence or absence of angioedema
- Presence or absence of respiratory compromise
- Presence or absence of circulatory compromise
- Localized or generalized urticarial
- Response to therapy

## QUALITY METRICS

- Percentage of patients with anaphylaxis that receive Epinephrine
- Airway assessment documented
- Documentation of estimated weight in kilograms

# Altered Mental Status

## History

- History from bystanders
- Environment where patient found
- Past medical history
- Medications
- Recent illness
- Changes in feeding / sleeping
- Lethargy
- Diabetes
- History of trauma
- Potential ingestion

## Signs and Symptoms

- Decreased mental status or lethargy
- Change in baseline mental status
- Bizarre behavior
- Hypoglycemia
- Hyperglycemia
- Irritability
- Fever

## Differential

- Head trauma
- CNS (stroke, tumor, seizure, infection)
- Hypothermia
- Infection
- Thyroid
- Shock (septic, metabolic, traumatic)
- Diabetes (hyper / hypoglycemia)
- Toxicological or Ingestion
- Acidosis / Alkalosis
- Environmental exposure
- Pulmonary (Hypoxia)
- Electrolyte abnormality
- Psychiatric disorder

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Immobilize cervical spine if suspected spinal injury.
3. Check blood glucose level.
4. If blood glucose < 60 mg/dL (or suspected) and patient is conscious with an intact gag reflex, administer **ORAL GLUCOSE one tube (15g)**.
5. If opioid overdose suspected and airway compromise or inadequate respiratory effort present refer to POISONING AND OVERDOSE Protocol.
6. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access. Consider **NORMAL SALINE 20 mL/kg** fluid bolus as needed to a maximum of 60 mL/kg.
3. If blood glucose < 60 mg/dL, administer **DEXTROSE 10% (D10)**; administer **5mL/kg**
  - a. Repeat blood glucose. Consider repeating the dose if blood glucose < 60 mg/dL, with symptoms of hypoglycemia.
4. If no IV access available, administer **GLUCAGON IM/IN.**
  - < 20 kg: **0.5 mg IM** or **IN**
  - > 20 kg: **1 mg IM** or **IN**
5. If opioid overdose suspected and airway compromise or inadequate respiratory effort present refer to POISONING AND OVERDOSE Protocol.

# Altered Mental Status

## PEARLS

- Altered mental status may be caused by many factors including the following: stroke, drug overdose, infection, hypoglycemia, hyperglycemia or trauma.
- Be aware of AMS as presenting sign of an environmental toxin or Haz-Mat exposure, and protect personal safety and that of other responders.
- A careful assessment of the patient, the scene and the circumstances should be undertaken.
- Pay careful attention to the head exam for signs of trauma / injury.
- DO NOT assume recreational drug use and/or alcohol are the sole reasons for Altered Mental Status.
- DO NOT assume Altered Mental Status is the result solely of an underlying psychiatric etiology.
  - Underlying medical or trauma conditions can precipitate a deterioration of a patients underlying mental health disease.

PEDIATRIC GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Verbal	3
	To Pain	2
	None	1
Verbal Response	Oriented (Smiles, coos, oriented to sounds, interacts)	5
	Confused (Cries but consolable, Irritable)	4
	Inappropriate Words (Inconsolable, Persistent Crying)	3
	Incomprehensible Sounds (Moans to Pain)	2
	None (No vocalization)	1
Best Motor Response	Obeys Commands (normal spontaneous movements)	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain (decorticate)	3
	Extension to Pain (decerebrate)	2
	None	1

## KEY DOCUMENTATION ELEMENTS

- GCS or AVPU description
- Pupil, neck and head exam were done
- Glucose was documented
- Temperature was taken when able
- Patient and medic safety were considered

## PERTINENT ASSESSMENT FINDINGS

- Mental status
- Breath odor
- Skin temperature

## QUALITY METRICS

- Blood glucose obtained. Hypoglycemia considered and treated appropriately
- Naloxone is used as therapeutic intervention, not a diagnostic tool
- Documentation of estimated weight in kilograms

# Brief Resolved Unexplained Event (BRUE)

## History

- Age < 1 year
- Circumstances and symptoms before, during and after event
- Duration
- Associated symptoms (fever, congestion, cough, rhinorrhea, vomiting, diarrhea, rash, dyspnea, fussy, lethargy, poor sleep, poor feeding)
- Prior history of BRUE
- Past medical history
- Family history of sudden unexplained death in other children or young adults
- Social history (home environment, etc)

## Signs and Symptoms

- Absent, decreased or irregular breathing
- Color change (central cyanosis or pallor)
- Hypertonia or Hypotonia
- Altered level of responsiveness

## Differential

- Gastric reflux
- Swallowing dysfunction
- Nasal congestion
- Periodic breathing of the newborn
- Breath-holding spell
- Change in tone associated with choking, gagging, crying, feeding
- Seizures
- Child abuse or neglect
- Trauma (accidental / non-accidental)

## Definition

**Brief Resolved Unexplained Event (BRUE):** An event in an infant **less than 1 year** reported by a bystander as sudden, brief (less than 1 min), completely resolved upon EMS arrival that includes one or more of the following:

- Absent, decreased or irregular breathing
- Color change (central cyanosis or pallor)
- Marked change in muscle tone (hyper- or hypotonia)
- Altered level of responsiveness

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
  - a. Maintain and support airway.
  - b. Continuous pulse oximetry.
  - c. Check blood glucose level.
2. If hypoglycemic (glucose < 60 mg/dL) refer to DIABETIC EMERGENCIES Protocol.
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Apply cardiac monitor and observe for any arrhythmias.

# Brief Resolved Unexplained Event (BRUE)

## PEARLS

- Regardless of patient appearance, all patients with a history of signs or symptoms of BRUE should be transported for further evaluation.
- BRUE is a group of symptoms, not a disease process.
- Thorough history is key:
  - a. History of circumstances and symptoms before, during, and after the event, including duration, interventions done, and patient color, tone, breathing, feeding, position, location, activity, level of consciousness.
  - b. Other concurrent symptoms (fever, congestion, cough, rhinorrhea, vomiting, diarrhea, rash, labored breathing, fussy, less active, poor sleep, poor feeding).
  - c. Prior history of BRUE.
  - d. Past medical history (prematurity, prenatal / birth complications, gastric reflux, congenital heart disease, developmental delay, airway abnormalities, breathing problems, prior hospitalizations, surgeries, or injuries).
  - e. Family history of sudden unexplained death or cardiac arrhythmia in other children or young adults.
  - f. Social history: who lives at home, recent household stressors, exposure to toxins / drugs, sick contacts).
  - g. Considerations for possible child abuse (multiple / changing versions of the story; reported mechanism of injury does not seem plausible, especially for child's developmental stage).

## KEY DOCUMENTATION ELEMENTS

- Document key aspect of history
  - Color change, apnea, change in muscle tone, caregiver resuscitation efforts, history of prematurity, prior BRUE events, past medical history
- Document key aspects of physical exam

## PERTINENT ASSESSMENT FINDINGS

- Signs of respiratory distress
- Color change
- Mental status changes

## QUALITY METRICS

- Complete set of vital signs recorded

# Diabetic Emergencies

## History

- Past medical history
- Medications (insulin, etc.)
- Recent blood glucose check
- Last meal

## Signs and Symptoms

- Altered mental status
- Combative / Irritable
- Seizures
- Nausea / Vomiting
- Dehydration
- Diaphoresis
- Weakness
- Signs of DKA (abdominal pain, fruity breath, Kussmaul respirations)

## Differential

- Alcohol / Drug use
- Toxic ingestion
- Trauma; head injury
- Seizure
- Stroke
- Altered mental status
- Diabetic Ketoacidosis

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Check blood glucose level.
3. If blood glucose < 60 mg/dL (or suspected) and patient is conscious with an intact gag reflex, administer **ORAL GLUCOSE one tube (15g)**.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If blood glucose < 60 mg/dL, administer **DEXTROSE 10% (D10) 5mL/kg**
  - a. Repeat blood glucose. Consider repeating the dose if blood glucose < 60 mg/dL, with symptoms of hypoglycemia.
4. If no IV access available, administer **GLUCAGON IM/IN**.
  - < 20 kg: **0.5 mg IM or IN**
  - > 20 kg: **1 mg IM or IN**
5. If blood glucose > 300 mg/dL, administer **NORMAL SALINE 20 mL/kg** fluid bolus. Reassess and re-bolus as needed as lungs remain clear.

## Hypoglycemia Refusal Criteria

### **\*\*Must contact Medical Control\*\***

- Repeat glucose is greater than 80 mg/dL.
- Patient is a known diabetic.
- Patient returns to normal mental status, with no focal neurologic signs / symptoms after receiving glucose / dextrose.
- Patient can promptly obtain and will eat a carbohydrate meal.
- Patient or legal guardian refuses transport and EMS providers agree transport not indicated.
- A reliable adult will be staying with patient.
- No major co-morbid symptoms exist, like chest pain, shortness of breath, seizures, intoxication.
- A clear cause of the hypoglycemia is identified (e.g. missed meal).

# Diabetic Emergencies

## PEARLS

### Hypoglycemia

- Dextrose 10% is the preferred formulation for administration for hypoglycemia.
  - There are no statistically significant differences in the median recovery time following administration of D10% versus D50%.
- Patients taking oral diabetic medications (particularly Sulfonylureas, i.e. glyburide, glipizide) and/or long acting insulin, should be encouraged to allow transportation to a medical facility as they are at risk of recurrent hypoglycemia that can be delayed for hours and require close monitoring even after normal blood glucose is established.
- Patients who meet criteria to refuse care after a hypoglycemic event should be instructed to contact their physician and consume a meal.
- If possible, have family / patient turn off insulin pumps.
- Consider potential for intentional overdose of hypoglycemic agents

### Hyperglycemia

- Consider causes for hyperglycemia:
  - a. Insulin – this refers to any medication changes for insulin or oral medications including poor compliance or malfunctioning insulin pump.
  - b. Infection – underlying infection can cause derangements in glucose control
- Asymptomatic hyperglycemia poses no risk to the patient while inappropriately aggressive interventions to manage blood sugar can harm patients. Overly aggressive administration of fluid in hyperglycemic patients may cause cerebral edema or dangerous hyponatremia.
- Diabetic ketoacidosis (DKA) is a life-threatening emergency defined as uncontrolled hyperglycemia and the signs and symptoms of ketoacidosis.

Signs and symptoms of DKA include uncontrolled blood glucose usually greater than 250 mg/dL, weakness, altered mental status, abdominal pain, nausea, vomiting, polyuria (excessive urination), polydipsia (excessive thirst), fruity odor on the breath (from ketones) and tachypnea (Kussmaul respirations—low EtCO<sub>2</sub>).

## KEY DOCUMENTATION ELEMENTS

- Document glucose level.
- Document reassessment of vital signs and mental status after treatment.
- Document patient capacity and contacting Medical Control for all diabetic refusals.

## PERTINENT ASSESSMENT FINDINGS

- Concomitant trauma.
- Diaphoresis or hypothermia may be associated with hypoglycemia.
- Abdominal pain, “fruity breath,” and Kussmaul breathing may be associated with DKA

## QUALITY METRICS

- Glucose level checked when appropriate.
- If patient released at scene, criteria documented for safe release.
- Hyper- / Hypoglycemia considered and treated appropriately
- Documentation of estimated weight in kilograms



# Foreign Body Airway Obstruction

## History

- Time of onset of symptoms
- Associated symptoms
- Choking or other evidence of upper airway obstruction
- History of trauma

## Signs and Symptoms

Sudden onset of respiratory distress:

- Coughing
- Wheezing
- Gagging
- Stridor
- Shortness of breath
- Abnormal color (cyanosis or pallor)

## Differential

- Cardiac arrest
- Respiratory arrest
- Anaphylaxis
- Esophageal obstruction

## All Levels

### Conscious Patient – Able To Speak:

1. **UNIVERSAL PATIENT CARE.**
2. Leave patient alone; offer reassurance.
3. Encourage coughing.

### Conscious Patient – Unable To Speak:

1. **For an Infant (< 1 yo):** Administer five back blows followed by five chest thrusts repeatedly until the foreign body is expelled or until the patient becomes unconscious / unresponsive.  
**For a Child:** Administer abdominal thrusts / Heimlich maneuver until the foreign body is expelled or until the patient becomes unconscious.
2. After the obstruction is relieved, reassess the airway, lung sounds, skin color and vital signs.
3. **UNIVERSAL PATIENT CARE.**

### Unconscious Patient:

1. Place patient in a supine position (if applicable) and begin chest compressions.
2. Open the airway and check for Foreign Body Airway Obstruction. If object is visible, perform finger sweep to remove.
3. If object is not visible, continue chest compressions until object dislodged.

## EMT-Intermediate & Paramedic

### Unconscious Patient:

1. Continue above treatment.
2. Perform advanced airway control measures as available, using the AIRWAY MANAGEMENT Protocol. Utilize Magill forceps as necessary.

# Foreign Body Airway Obstruction

## PEARLS

- If air exchange is adequate with a partial airway obstruction, do not interfere; instead, encourage the patient to cough up the obstruction. Continue to monitor the patient for adequacy of air exchange. If air exchange becomes inadequate, continue with the protocol.
- Do not perform a blind finger sweep in the mouth and posterior pharynx. This may push the object farther into the airway.

## KEY DOCUMENTATION ELEMENTS

- Initial vital signs and physical exam
- Interventions attempted and the number of attempts to achieve a successful result
- Subsequent vital signs and physical exam to assess for change after interventions

## PERTINENT ASSESSMENT FINDINGS

- Acute worsening of respiratory status or evidence of hypoxemia

## QUALITY METRICS

# Nausea / Vomiting

## History

- Appearance of emesis (bloody, etc)
- Time of last meal
- Last bowel movement / Emesis
- Improvement or worsening with food or activity
- Duration of symptoms
- Sick contacts
- Past medical history
- Past surgical history
- Medications
- Travel history
- Suspected food poisoning

## Signs and Symptoms

- Fever
- Pain
- Constipation
- Diarrhea
- Anorexia
- Hematemesis

## Differential

- CNS (increased pressure, headache, tumor, trauma or hemorrhage)
- Drugs
- Appendicitis
- Gastroenteritis
- GI or Renal disorders
- Diabetic Ketoacidosis (DKA)
- Infections (pneumonia, influenza)
- Electrolyte abnormalities
- Food or toxin induced

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. For older pediatric patients that are able to follow commands, consider a trial of inhalation from an isopropyl alcohol prep pad.
3. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT.**
2. For patient > 4 years old, administer **ONDANSETRON ODT 4mg PO.**
  - a. Contraindicated for suspected or known diagnosis of prolonged QT syndrome.
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access.
3. Consider **NORMAL SALINE 20 mL/kg fluid bolus** for signs of dehydration.
4. For patient > 6 months old, administer **ONDANSETRON 0.15 mg/kg IV or IM** or for patients > 4 years old **ONDANSETRON ODT 4 mg PO.**
  - a. Maximum total dose: 4 mg. (Not to be repeated if already given by BLS provider)

# Nausea / Vomiting

## PEARLS

- Nausea and vomiting are symptoms of illness – in addition to treating the patient's nausea and vomiting a thorough history and physical are key to identifying what may be a disease in need of emergent treatment (e.g. bowel obstruction, myocardial infarction, pregnancy).
- Ondansetron is preferred in children for the treatment of nausea and vomiting.
- For very young pediatric patients, Ondansetron can be sedating.
- Inhaled isopropyl alcohol has shown promise as an antiemetic and may be superior to oral ondansetron. The mechanism of isopropyl alcohol's antiemetic effect remains unclear.

April MD, Oliver JJ, Davis WT, et al. Aromatherapy versus oral ondansetron for antiemetic therapy among adult emergency department patients: a randomized controlled trial. *Ann Emerg Med*, 2018 Aug; 72(2): 184-93.

## KEY DOCUMENTATION ELEMENTS

- Patient age and weight
- Medications given, including time, provider level, dose, dose units, route, response and complications
- Vital signs before and after medication administration
- History and physical with regard to etiology of nausea / vomiting

## PERTINENT ASSESSMENT FINDINGS

- Vital signs
- Risk factors for heart disease / ECG if applicable
- Pregnancy status
- Abdominal exam

## QUALITY METRICS

- In patients with nausea and vomiting, appropriate medication(s) was / were administered (including proper dosage) and the patient's response to treatment is documented
- Documentation of estimated weight in kilograms

# Respiratory Distress - Upper Airway

## History

- Time of onset
- Possibility of foreign body
- Concurrent symptoms (fever, cough, rhinorrhea, tongue / lip swelling, rash, labored breathing, FBAO)
- Home treatment
- Sick contacts
- History of trauma

## Signs and Symptoms

- Stridor
- Barking cough
- Gagging
- Drooling
- Inability to swallow
- Respiratory distress (hypoxia, retractions, nasal flaring, tripodding, cyanosis, tachypnea, etc)
- Anxious appearing
- Fever, cough, congestion

## Differential

- Croup
- Epiglottitis
- Allergic Reaction / Anaphylaxis
- Aspiration
- Foreign body
- Medication or toxin
- Trauma

## EMR, EMT-Basic & EMT-Intermediate

### 1. UNIVERSAL PATIENT CARE.

- a. Give supplemental **OXYGEN** as needed.
- b. Suction the nose and/or mouth if excessive secretions are present.

### 2. Manage airway per AIRWAY MANAGEMENT Protocol.

- a. The airway should be managed in the least invasive way possible. For suspected epiglottitis do not attempt invasive airway maneuvers unless absolutely necessary.

### 3. Place patient in position of comfort. Avoid any agitation.

### 4. For allergic reaction and/or anaphylaxis refer to ALLERGIC REACTION / ANAPHYLAXIS Protocol.

### 5. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## Paramedic

### 1. Continue **EMR / BLS / ILS TREATMENT**.

2. Children with severe croup with signs of stridor at rest, give **RACEMIC EPINEPHRINE 0.5 mL of 2.25% solution diluted in 3 mL NS nebulized**.

# Respiratory Distress - Lower Airway

## History

- Time of onset
- Possibility of foreign body
- Concurrent symptoms (fever, cough, rhinorrhea, tongue / lip swelling, rash, labored breathing, FBAO)
- Usual triggers of symptoms (cigarette smoke, change in weather, URI)
- Home treatment (oxygen, nebulizers)
- Sick contacts

## Signs and Symptoms

- Wheezing or stridor
- Respiratory distress (hypoxia, retractions, nasal flaring, tripodding, cyanosis, tachypnea, etc)
- Shortness of breath (inability to speak full sentences)
- Anxious appearing
- Fever, cough, congestion
- Tachycardia

## Differential

- Asthma / Reactive Airway Disease
- Bronchiolitis
- Allergic Reaction / Anaphylaxis
- Aspiration
- Foreign body
- Pneumonia
- Congenital heart disease
- Medication or toxin
- Trauma

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
  - a. Give supplemental **OXYGEN** as needed.
  - b. Suction the nose and/or mouth if excessive secretions are present.
2. Manage airway per AIRWAY MANAGEMENT Protocol.
3. Place patient in position of comfort.
4. Consider **DuoNeb** by nebulizer. May repeat x2 if needed for continued symptomatic relief.
5. For allergic reaction and/or anaphylaxis refer to ALLERGIC REACTION / ANAPHYLAXIS Protocol.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. **METHYLPREDNISOLONE 2 mg/kg IV/IM.** (Maximum dose 125 mg)
4. Reassess need for intubation if respiratory symptoms worsen or do not improve with treatment (e.g. BVM)
5. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.
2. In patients with persistent respiratory distress despite the above treatment, consider **MAGNESIUM SULFATE 50 mg/kg IV** in 50 mL NS over 10-15 minutes. Maximum dose: 2 grams.
3. Continue to monitor need for advanced airway if respiratory symptoms worsen or do not improve with treatment. See AIRWAY MANAGEMENT Protocol.
4. If in severe distress with impending respiratory failure, consider **EPINEPHRINE (1:1,000)** at **0.01 mg/kg IM**. Maximum dose: 0.3 mg

# Respiratory Distress

## Upper and Lower Airway

### PEARLS

#### General Respiratory Disress

- Pulse oximetry and end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be routinely used as an adjunct to other forms of respiratory monitoring.
- Supraglottic devices and intubation – should be utilized only if bag-valve-mask ventilation fails - the airway should be managed in the least invasive way possible.

#### Upper Airway

- **Croup** typically affects children 6 months- 3 years. It is viral, low grade fever, gradual onset (viral prodrome), no drooling is noted.
- **Epiglottitis** is bacterial in etiology. Rapid onset. Drooling, Dysphagia, Distress. Possible stridor. Patient wants to sit up to keep airway open.
- For suspected Epiglottitis, DO NOT attempt intubation, invasive glottic visualization or IV access.
- For Bronchiolitis, suctioning can be a very effective intervention to alleviate distress, since infants are obligate nose breathers.
- Upper airway obstruction can have inspiratory, expiratory or biphasic stridor
- Foreign bodies can mimic croup, it is important to ask about a possible choking event.
- In croup, without stridor at rest (i.e. severe croup) or other evidence of respiratory distress, inhaled medications may not be necessary.

#### Lower Airway

- Wheezing in the breathing patient with respiratory distress indicates lower airway disease, which may come from a variety of causes. The patient with severe lower airway disease may have altered LOC, be unable to talk, may have absent or markedly decreased breath sounds and severe retractions with accessory muscle use.
- Beware of patients with a “silent chest” (absent breath sounds) as this may indicate severe bronchospasm and impending respiratory failure.
- Remember that not all wheezing is caused by asthma and that not all asthmatics wheeze.
  - Patients with congenital heart disease / congestive heart failure may present with lung sounds that mimic asthma (“cardiac wheeze”)

### KEY DOCUMENTATION ELEMENTS

- Respiratory rate
- Oxygen saturation and/or EtCO<sub>2</sub>
- Use of accessory muscles
- Breath sounds
- Air entry
- Mental status
- Color
- Response to interventions

### PERTINENT ASSESSMENT FINDINGS

- In the setting of severe bronchoconstriction, wheezing might not be heard. Patients with known asthma who complain of chest pain or shortness of breath should be empirically treated, even if wheezing is absent.

### QUALITY METRICS

- Utilization of continuous pulse oximetry and EtCO<sub>2</sub>
- Appropriate medication(s) were administered (including proper dosage) and the patient's response
- Documentation of estimated weight in kilograms

# **Respiratory Distress Upper and Lower Airway**

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# Respiratory Distress with a Tracheostomy Tube / Ventilator

## History

- Birth defect (tracheal atresia, tracheomalacia, craniofacial abnormalities)
- Past medical history (bronchopulmonary dysplasia, muscular dystrophy, post-traumatic brain or spinal cord injury, etc. )
- History of tracheostomy
- Possibility of foreign body
- Concurrent symptoms (fever, cough, rhinorrhea, rash, labored breathing)
- Usual triggers of symptoms (cigarette smoke, change in weather, URI)
- Sick contacts

## Signs and Symptoms

- Power or equipment failure at residence
- Wheezing, rhonchi, stridor
- Respiratory distress (hypoxia, retractions, nasal flaring, tripodding, cyanosis, tachypnea, etc)
- Shortness of breath (inability to speak full sentences)
- Copious secretions coming from tracheostomy tube
- Anxious appearing
- Fever, cough, congestion
- Tachycardia

## Differential

- Disruption of oxygen source
- Dislodged or obstructed tracheostomy tube
- Detached or disrupted ventilator circuit
- Ventilator failure
- Asthma / Reactive Airway Disease
- Allergic Reaction / Anaphylaxis
- Aspiration
- Foreign body
- Pneumonia
- Congenital heart disease
- Medication or toxin
- Trauma

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Place patient in position of comfort.
3. Administer 100% **OXYGEN** per **tracheostomy collar**.
4. If tracheostomy tube is obstructed with secretions, suction tracheostomy tube.
  - a. Remove inner catheter of tracheostomy tube and re-suction.
  - b. Suction for no more than 10-15 seconds while withdrawing the suction catheter.
  - c. 2-3 mL saline may be used to help loosen secretions.
5. If tracheostomy tube still remains obstructed have caregiver / family assist in changing tracheostomy tube if there is a spare tube available.
6. If tracheostomy tube still remains obstructed, ventilate with 100% **OXYGEN** via **Bag Valve Mask (BVM)**.
7. Consider **DuoNeb** by nebulizer. May repeat x2 if needed for continued symptomatic relief.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Reassess patency of tracheostomy tube. If needed, replace tracheostomy tube with spare tracheostomy tube or appropriately sized ET tube into stoma.

# Respiratory Distress with a Tracheostomy Tube / Ventilator

## PEARLS

- Pulse oximetry and end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be routinely used as an adjunct to other forms of respiratory monitoring.
- Always talk to family / caregivers as they have specific knowledge and skills.
- Use patients equipment if available and functioning properly.
- Estimate suction catheter size by doubling the inner tracheostomy tube diameter and rounding down.
- Suction depth: ask family / caregiver. No more than 3 to 6 cm typically.
- Do NOT force suction catheter. If unable to pass, then tracheostomy tube should be changed.
- Always deflate tracheal tube cuff before removal.
- ETT size should be same as tracheostomy tube size. Also have a 0.5 size smaller available.
- **DOPE:** Displaced tracheostomy tube / ETT, **O**bstructed tracheostomy tube / ETT, **P**neumothorax and **E**quipment Failure.

## KEY DOCUMENTATION ELEMENTS

- Respiratory assessment
- Tracheostomy tube assessment (obstruction, etc)
- Tracheostomy tube size
- Documentation of replacement trach / ETT size

## PERTINENT ASSESSMENT FINDINGS

- Tracheostomy tube assessment
- **DOPE**

## QUALITY METRICS

- Utilization of continuous pulse oximetry and EtCO<sub>2</sub>

# Seizure / Status Epilepticus

## History

- Reported / Witnessed seizure activity
- Previous seizure history
- Seizure medications (recent changes, compliance)
- Medications administered prior to arrival
- History of trauma
- History of diabetes
- Time of seizure onset
- Number of seizures
- Alcohol use, abuse or abrupt cessation
- Fever

## Signs and Symptoms

- Decreased mental status
- Sleepiness
- Incontinence
- Observed seizure activity
- Evidence of trauma
- Unconscious

## Differential

- CNS (head) trauma
- Tumor
- Metabolic, Hepatic, or Renal failure
- Hypoxia
- Electrolyte abnormality
- Drugs, Medications, Non-compliance
- Infection / Fever
- Hypoglycemia

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level.
2. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
3. Immobilize cervical spine if indicated.
4. Position patient to prevent injury.
5. If patient has a fever (>100.4°F) and febrile seizure is suspected, attempt to cool the patient by removing any excess clothing and apply cool compresses to the body.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. If seizure persists longer than three minutes, administer **MIDAZOLAM**:  
**IN/IM: 0.2 mg/kg** (maximum dose 5 mg)  
- OR -  
**IV/IO: 0.1 mg/kg** over 2 minutes (maximum dose 5 mg); may repeat x 1 after 5 minutes if seizure persists.
4. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.



**Medical Control**



5. If seizure persists, contact Medical Control for additional **MIDAZOLAM**.

# Seizure / Status Epilepticus

## PEARLS

- **Simple Febrile Seizure** is defined as a generalized tonic-clonic seizure that last less than 15 minutes in a patient between the ages of 6 months and 5 years. Only occurs once in a 24 hour period.
- **Complex Febrile Seizure** is defined as any exception to the above.
- **Status Epilepticus** is defined as two or more successive seizures without a period of consciousness or recovery. This is a true emergency requiring rapid airway control, treatment, and transport.
- **Grand Mal Seizures (generalized)** are associated with loss of consciousness, incontinence, and tongue trauma.
- **Focal Seizures** affect only a part of the body and are not usually associated with a loss of consciousness, but can propagate to generalized seizures with loss of consciousness.
- Benzodiazepines are effective in terminating seizures; **do not delay IM/IN administration while initiating an IV.**
- Many airway / breathing issues in seizing patients can be managed without intubation or placement of an advanced airway. Reserve these measures for patients that fail less invasive maneuvers as noted above.
- For new onset seizures or seizures that are refractory to treatment, consider other potential causes including, but not limited to, trauma, stroke, electrolyte abnormality, toxic ingestion, pregnancy with eclampsia, hyperthermia.

## KEY DOCUMENTATION ELEMENTS

- Actively seizing during transport and time of seizure onset / cessation
- Concurrent symptoms of apnea, cyanosis, vomiting, bowel / bladder incontinence or fever
- Medication amounts / routes given by bystanders or prehospital providers
- Neurologic status (GCS, nystagmus, pupil size, focal neurologic deficit or signs of stroke)
- Blood glucose level

## PERTINENT ASSESSMENT FINDINGS

- Fever
- Acute worsening of respiratory status or evidence of hypoxemia
- Neurologic status
- Blood glucose level
- Be alert for concurrent traumatic injuries in seizure patients

## QUALITY METRICS

- Time to administration of anticonvulsant medication
- Blood glucose level obtained and treated if necessary
- Documentation of estimated weight in kilograms

# Sepsis

## History

- Duration and severity of fever
- Altered mental status
- Past medical history
- Medications / Recent antibiotics
- Immunocompromised (Transplant, HIV, Diabetes, Cancer)
- Recent hospitalization / Healthcare facility
- Prosthetic device / Indwelling device
- Last antipyretic (acetaminophen, ibuprofen)

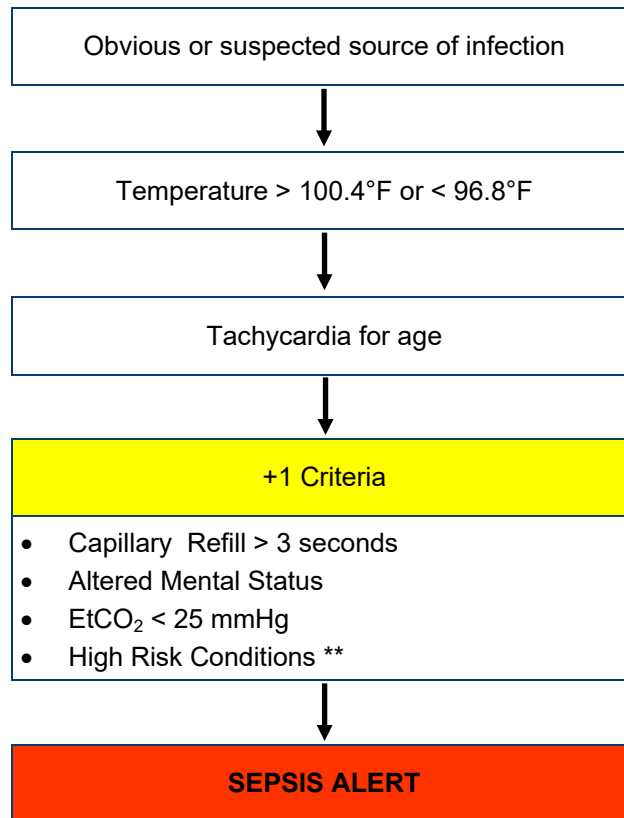
## Signs and Symptoms

- Hyperthermia > 100.4°F (38°C)
- Hypothermia < 96.8°F (36°C)
- Tachycardia for age
- Impaired perfusion (cap refill)
- Hypotension for age
- Altered mental status
- Hyperglycemia / Hypoglycemia

## Differential

- Infections (UTI, pneumonia, skin/soft tissue, etc)
- Cancer / Tumors / Lymphomas
- Medication or drug reaction
- Hyperthyroidism
- Heat emergencies
- Meningitis
- Hypoglycemia / Hypothermia

## Criteria



### \*\*High Risk Conditions:

- Splenectomy / Asplenia
- Sickle Cell Disease
- PICC/Central Venous Catheter
- CSF Shunt
- Tracheostomy
- Indwelling Urinary Catheter
- Cerebral Palsy
- Severe Intellectual Disability
- Developmental Disability
- Cancer
- Immunosuppression
- Petechial or Purpuric Rash

## Pediatric Tachycardia

Age	Tachycardia
Neonate (0-1 mo)	> 180
Infant (1-12 mo)	> 160
Toddler (1-3 yrs)	> 150
Pre-School (3-5 yrs)	> 140
School Age (5-12 yrs)	> 120
Adolescent (12-18 yrs)	> 100

Protocol Continues

# Sepsis

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level. If blood glucose < 60 mg/dL refer to DIABETIC EMERGENCIES protocol for treatment.
2. Reassess patient and vital signs every 5 minutes.
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Notify receiving hospital of “**SEPSIS ALERT**”.
3. Consider 12-Lead ECG.
4. Establish at least one large bore IV.
  - a. Administer **NORMAL SALINE 20ml/kg IV** fluid bolus (**Document TOTAL amount of IVF given**).
    - i. Reassess after each 20 mL/kg increment and STOP fluids if signs of pulmonary edema (increasing shortness of breath or rales / crackles on lung exam).
    - ii. May repeat as needed as long as pulmonary edema is not suspected.
    - iii. Total amount of IVF should not exceed 60 mL/kg.
5. Continue to reassess patient including vital signs (manual BP), breath sounds, capnography, pulse oximetry, cardiac monitor.



### Medical Control



6. Medical Control may consider **DOPAMINE** if no response to IV fluid therapy. (**\*\*\*ALS ONLY \*\*\***)
  - a. See Dopamine Drip Chart

# Sepsis

## PEARLS

- **Sepsis** is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection.
  - In lay terms, sepsis is a life-threatening condition that arises when the body's response to an infection injures its own tissues and organs.
- **Septic Shock** is a subset of sepsis in which underlying circulatory and cellular / metabolic abnormalities resulting in hypotension that require vasopressors and having a serum lactate level of  $\geq 2$  mmol/L despite adequate volume resuscitation, resulting in a higher risk of mortality.
- Early recognition of sepsis allows for attentive care and early administration of antibiotics.
- Quantitative waveform capnography can be a reliable surrogate for lactate monitoring in detecting metabolic distress in sepsis patients.  $\text{EtCO}_2 < 25$  mm Hg are associated with serum lactate levels  $> 4$  mmol/L.
- Aggressive IV fluid therapy is the most important prehospital treatment for sepsis. Suspected septic patients should receive repeated fluid boluses while being checked frequently for signs of pulmonary edema, especially patients with known history of CHF or ESRD on dialysis. STOP fluid infusion in the setting of pulmonary edema.
- ECG should be considered with suspected sepsis, but should not delay care in order to obtain.

Normal Pediatric Vital Signs			
Age	Pulse	Systolic BP	Respiratory Rate
Neonate (0-1 mo)	100-180	$>60$	30-60
Infant (1-12 mo)	100-160	$>70$	30-60
Toddler (1-3 yrs)	90-150	$>70 + (\text{age in yrs} \times 2)$	24-40
Pre-School (3-5 yrs)	80-140	$>70 + (\text{age in yrs} \times 2)$	22-34
School Age (5-12 yrs)	70-120	$>70 + (\text{age in yrs} \times 2)$	18-30
Adolescent (12-18 yrs)	60-100	$>90$	12-20

*\*\*Created based off of Illinois EMSC Guidelines*

## KEY DOCUMENTATION ELEMENTS

- Sepsis criteria that patient met
- Full vital signs with reassessment every 15 minutes
- Neurologic status assessment
- Amount of IV fluid given

## PERTINENT ASSESSMENT FINDINGS

- Full vital signs
- Criteria for sepsis
- Findings of hypoperfusion: AMS, hypotension,  $\text{EtCO}_2 < 25$  mmHg

## QUALITY METRICS

- Advance hospital notification for suspected sepsis patients
- Administration of IV fluid to suspected sepsis patients unless contraindicated
- Documentation of estimated weight in kilograms

# Sepsis

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Blank**



# Shock

## History

- Blood loss
- Fluid loss (Vomiting, Diarrhea, Fever)
- Infection
- Cardiac problems (Congenital)
- Medications
- Allergic reaction
- Poor oral intake

## Signs and Symptoms

- Restlessness, confusion
- Weakness
- Dizziness
- Increased HR, rapid pulse
- Decreased BP
- Pale, cool, clammy skin
- Delayed capillary refill (> 2 sec)

## Differential

- Trauma
- Infection
- Dehydration (Vomiting, Diarrhea, Fever)
- Congenital Heart Disease
- Medication or Toxin
- Allergic reaction

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Keep patient warm and elevate feet if possible.
3. Control bleeding as necessary. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access. Consider **NORMAL SALINE 20 mL/kg IV**. May repeat fluid bolus x2 as needed to a maximum of 60 mL/kg.
3. If tension pneumothorax suspected, perform NEEDLE DECOMPRESSION.
4. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT**.



## Medical Control



2. Consider **DOPAMINE** at **5mcg/kg/min** for hypotension not responsive to fluid bolus, titrated to age appropriate SBP.
  - a. See Dopamine Drip Chart

*\*\*Dopamine is provided premixed (400mg in 250mL D5W or 800mg in 500mL D5W). This yields a concentration of 1600mcg/mL.*

### Normal Pediatric Vital Signs

Age	Pulse	Systolic BP	Respiratory Rate
Neonate (0-1 mo)	100-180	>60	30-60
Infant (1-12 mo)	100-160	>70	30-60
Toddler (1-3 yrs)	90-150	>70 + (age in yrs x 2)	24-40
Pre-School (3-5 yrs)	80-140	>70 + (age in yrs x 2)	22-34
School Age (5-12 yrs)	70-120	>70 + (age in yrs x 2)	18-30
Adolescent (12-18 yrs)	60-100	>90	12-20

*\*\*Created based off of Illinois EMSC Guidelines*

# Shock

## PEARLS

- Early, aggressive IV fluid administration is essential in the treatment of suspected shock.
  - a. Therapeutic end-points in children are: Normal mental status, normal cap refill, normal pulses and heart rate, warm extremities, normal blood pressure.
- Patients predisposed to shock:
  - a. Immunocompromised (patients undergoing chemotherapy or with a primary or acquired immunodeficiency)
  - b. Adrenal insufficiency (Addison's disease, congenital adrenal hyperplasia, chronic or recent steroid use)
  - c. History of a solid organ or bone marrow transplant
  - d. Infants
  - e. Elderly
- Tachycardia can be a late sign of shock in children and a tachycardic child may be close to cardiovascular collapse.
- Decreasing heart rate and hypotension occur late in children and are signs of imminent cardiac arrest.

**Hypovolemic Shock:** Hemorrhage, Trauma, GI bleeding, Ruptured aortic aneurysm or Pregnancy related bleeding.

- Signs / Symptoms: Tachycardia, Weak thread pulse, Hypotension, Diaphoresis, Cool Skin, Pallor, Flat Neck Veins

**Cardiogenic Shock:** Heart failure, MI, Cardiomyopathy, Myocardial contusion, Ruptured ventricular / septum / valve, toxins.

- Signs / Symptoms: Chest pain, Shortness of breath, Rales, JVD, Hypotension, Tachycardia, Diaphoresis

**Distributive Shock:** Sepsis, Anaphylactic, Neurogenic (hallmark is warm, dry, pink skin with normal capillary refill time and typically alert), Toxins.

- Signs / Symptoms Neurogenic Shock: Sensory and/or motor loss, Hypotension, Bradycardia vs Normal heart rate, Warm, dry skin

**Obstructive Shock:** Pericardial tamponade, Pulmonary embolus, Tension pneumothorax. Signs may include hypotension with distended neck veins, tachycardia, unilateral decreased breath sounds or muffled heart sounds.

- Signs / Symptoms Tension Pneumothorax: Asymmetric or absent breath sounds, Respiratory distress or hypoxia, signs of shock including tachycardia and hypotension, JVD, tracheal deviation (late sign)

**Acute Adrenal Insufficiency:** State where body cannot produce enough steroids (glucocorticoids/ mineralocorticoids). May have primary or secondary adrenal disease or more commonly have stopped a steroid like prednisone.

## KEY DOCUMENTATION ELEMENTS

- Full vital signs with reassessment every 15 minutes
- Neurologic status assessment
- Amount of IV fluid given
- Medications given

## PERTINENT ASSESSMENT FINDINGS

- Full vital signs
- Decreased perfusion manifested by altered mental status, or abnormalities in capillary refill or pulses.

## QUALITY METRICS

- Percentage of patients who receive pressors for ongoing hypotension after receiving appropriate IV fluid
- Documentation of estimated weight in kilograms

# Bradycardia

## History

- Past medical history
- Foreign body exposure / Swallowed
- Respiratory distress or arrest
- Apnea
- Possible toxic or poison exposure
- Congenital disease
- Medication

## Signs and Symptoms

- Decreased heart rate
- Delayed capillary refill or cyanosis
- Mottled, cool skin
- Hypotension or arrest
- Altered level of consciousness

## Differential

- Respiratory failure (foreign body, secretions, infection)
- Hypoxia / Hypothermia
- Sinus bradycardia
- Congenital heart disease
- Athletic
- Head injury (elevated ICP) / Trauma
- Spinal cord lesion
- Overdose
- Hypoglycemia

## EMR

1. **UNIVERSAL PATIENT CARE.**
  - a. Support ABC's
  - b. Give supplemental oxygen as needed.
2. If patient shows signs of *cardiopulmonary compromise* (hypotension, AMS, signs of shock) despite oxygenation / ventilation (BVM) and **HR < 60** begin **CPR**.
3. Consider possible underlying causes of bradycardia (*see differential above*).
4. Check blood glucose level and if blood glucose < 60 mg/dL refer to DIABETIC EMERGENCIES Protocol.
5. Relay information to incoming ambulance.

## EMT-Basic

1. Continue **EMR TREATMENT**.
2. Perform 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT**.
2. Establish IV access. Consider **NORMAL SALINE 20 mL/kg IV/IO** if hypovolemic. May repeat as needed for signs of poor perfusion to a maximum of 60 mL/kg.
3. **EPINEPHRINE (1:10,000) 0.01 mg/kg IV/IO** for persistent bradycardia with signs of cardiopulmonary compromise. May repeat every 3-5 minutes as needed. (Maximum single dose: 1 mg)
4. **ATROPINE 0.02 mg/kg IV/IO** for increased vagal tone or primary AV block (minimum single dose: 0.1 mg; maximum single dose: 0.5mg). May be repeated once in 3-5 minutes. (Maximum total dose: 3 mg)
5. If bradycardia persists with signs of cardiopulmonary compromise, consider TRANSCUTANEOUS PACING.
  - a. Consider sedation with **MIDAZOLAM 0.1 mg/kg IV/IO/IN** (maximum dose 2mg).

# Bradycardia

## PEARLS

- In children, bradycardia almost always reflects hypoxia, rather than a primary cardiac problem. It is a pre-arrest rhythm and the prognosis is poor if left untreated. Immediate delivery of high-flow oxygen and assisted ventilation are essential. Untreated bradycardia will quickly cause shock, hypotension and death.
- Bradycardia should be managed via the least invasive manner possible, escalating care as needed
- Epinephrine is the first drug choice for persistent, symptomatic bradycardia.
- Atropine is the second choice, unless there is evidence of increased vagal tone or a primary AV conduction block, then give Atropine first.
- Consider potential culprit medications including beta-blockers, calcium channel blockers, sodium channel blockers/anti-depressants, digoxin, and clonidine.
- Consider hyperkalemia in the patient with wide complex bradycardia.
- Hypoxemia is a common cause of bradycardia; be sure to oxygenate the patient.

## KEY DOCUMENTATION ELEMENTS

- Cardiac rhythm / rate
- Time, dose and response of medications given
- Pacing: Time started or stopped, rate, joules, capture and response
- History of event supporting treatment of underlying causes

## PERTINENT ASSESSMENT FINDINGS

- 12-Lead ECG
- Respiratory status

## QUALITY METRICS

- Blood glucose obtained
- Correct medication and dose given for patient condition
- Correct application and use of cardiac pacing
- Use of sedation with cardiac pacing
- Documentation of estimated weight in kilograms

# Cardiac Arrest

## History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medication
- Existence of terminal illness
- Signs of lividity, rigor mortis
- DNR form

## Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

## Differential

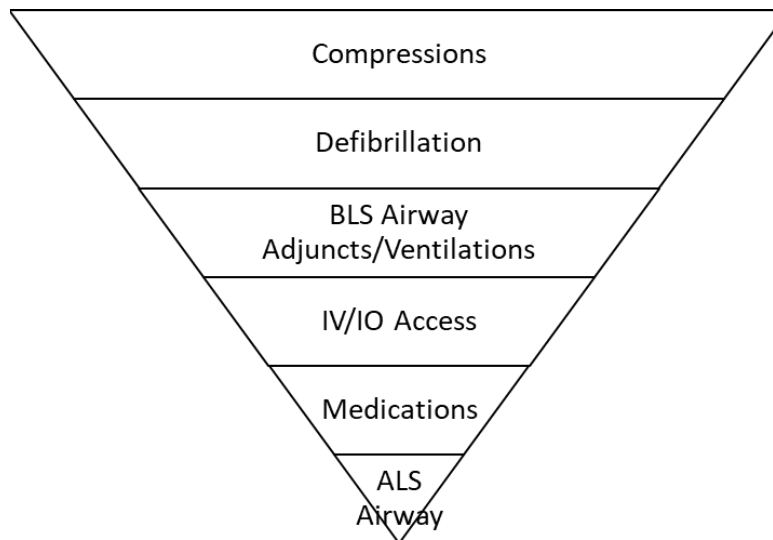
- Medical vs. Trauma
- V. fib vs Pulseless V. tach
- Asystole
- Pulseless Electrical Activity (PEA)

## High Performance CPR

- Chest compressions at a depth of at least 1/3 anteroposterior diameter or at least 1.5 inches in infants (< 1 yr) and 2 inches in children (1 yr - puberty)
- Rate of compressions between 100-120 per minute
- Allowing for complete chest recoil
- Minimizing interruptions between cycles to less than 10 seconds (Compression fraction >60%)
- Switching providers frequently, about every 2 minutes or sooner if fatigued

## Code Resource Management

- Crews should coordinate their duties keeping the call priorities in mind. Intervention priorities are (in order of highest to lowest):



# Cardiac Arrest

## EMR & EMT-Basic

1. Check airway, breathing and circulation.
2. If pulseless, begin high quality CPR, apply AED and follow the prompts.
  - a. If the AED indicates "SHOCK ADVISED", call out "CLEAR!", check for the safety of others and follow the prompts on the AED to deliver the defibrillation.
  - b. Immediately resume CPR after defibrillation.
3. Ventilate with 100% oxygen.
4. Manage airway with appropriate adjunct. Refer to AIRWAY MANAGEMENT Protocol.
5. Follow current AHA BLS guidelines.
6. Relay information to incoming ambulance and/or initiate transport and call for intercept per INTERCEPT CRITERIA.
7. If return of pulses, refer to RETURN OF SPONTANEOUS CIRCULATION Protocol.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Ensure high quality CPR at all times.
3. Refer to appropriate dysrhythmia protocol:
  - a. ASYSTOLE / PEA
  - b. V-FIB / PULSELESS V-TACH
4. Keep the following in mind:
  - a. Rhythm checks, defibrillation and medications are completed at the top of the 2 minute cycle.
  - b. Compression fraction should be greater than 60% and EtCO<sub>2</sub> greater than 10mmHg.
5. Consider placement of advanced airway per AIRWAY MANAGEMENT Protocol.
6. If return of pulses, refer to RETURN OF SPONTANEOUS CIRCULATION Protocol.

# Cardiac Arrest

## - Asystole / PEA -

### History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medication
- Existence of terminal illness
- Suspected abuse
- Airway obstruction

### Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

### Differential

#### H's and T's

- Hypovolemia
- Hypoxia
- Massive myocardial infarction
- Tension pneumothorax
- Acidosis / Hyperkalemia
- Toxins - Drug Overdose
- Hypothermia
- Pericardial tamponade
- Massive Pulmonary Embolism

### H's and T's

- Hypovolemia – Volume infusion
- Hypoxia – Oxygenation & ventilation, CPR
- Hydrogen ion (acidosis) – Ventilation, CPR
- Hypo/Hyperkalemia
- Hypothermia - Warming
- Tension pneumothorax – Needle decompression
- Tamponade, cardiac – Volume infusion
- Toxins – Agent specific antidote
- Thrombosis, pulmonary – Volume infusion, Ventilation
- Thrombosis, coronary – Emergent PCI

### EMT-Intermediate & Paramedic

1. Initiate HIGH QUALITY CPR.
2. Establish IV/IO access.
3. **NORMAL SALINE 20 mL/kg** fluid bolus. May repeat as needed to a total of 60 mL/kg.
4. **EPINEPHRINE (1:10,000) 0.01 mg/kg IV/IO every 3-5 minutes** as long as patient remains pulseless.
5. Consider possible causes and treatments (H's and T's).
6. Call for intercept per INTERCEPT CRITERIA.
7. If return of pulses, refer to the RETURN OF SPONTANEOUS CIRCULATION Protocol.

# Cardiac Arrest

## - V-Fib / Pulseless V-Tach -

### History

- Estimated down time
- Past medical history
- Medications
- Events leading to arrest
- Airway obstruction
- Hypothermia

### Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless

### Differential

- Respiratory failure / Airway obstruction
- Hyper / Hypokalemia,
- Hypovolemia
- Hypothermia, Hypoglycemia, Acidosis
- Tension pneumothorax, Tamponade
- Toxin or medication
- Congenital Heart Disease

### H's and T's

- Hypovolemia – Volume infusion
- Hypoxia – Oxygenation & ventilation, CPR
- Hydrogen ion (acidosis) – Ventilation, CPR
- Hypo/Hyperkalemia
- Hypothermia - Warming
- Tension pneumothorax – Needle decompression
- Tamponade, cardiac – Volume infusion
- Toxins – Agent specific antidote
- Thrombosis, pulmonary – Volume infusion, Ventilation
- Thrombosis, coronary – Emergent PCI

### EMT-Intermediate

1. Continue high quality CPR per CARDIAC ARREST Protocol pausing for rhythm checks every 2 minutes for no more than 10 seconds.
2. **DEFIBRILLATE** at **2 J/kg**. Resume CPR immediately after defibrillation for 2 minutes.
3. Establish vascular access.
4. After 2 minutes of CPR and if shockable rhythm, **DEFIBRILLATE** at **4 J/kg**. Resume CPR for 2 minutes.
5. **EPINEPHRINE (1:10,000) 0.01 mg/kg IV/IO every 3-5 minutes** as long as patient remains pulseless.
6. **DEFIBRILLATE** at **≥4 J/kg** (max 10 J/kg or adult dose) every 2 minutes as needed. Resume CPR for 2 minutes after each defibrillation.
7. For V-fib/Pulseless V-tach refractory to third defibrillation administer **AMIODARONE 5 mg/kg IV/IO** (max 300mg). May repeat x2 at 5 mg/kg IV/IO every 5 minutes if needed. (Max total dose 15 mg/kg).
8. If V-Fib or V-Tach persists or patient is allergic to AMIODARONE, consider **LIDOCAINE 1 mg/kg IV/IO**. Maintenance **LIDOCAINE infusion at 20-50 mcg/kg/min**.
9. Continue cycles of 2 minutes of CPR followed by defibrillation as needed.
10. Consider possible causes and treatments (H's and T's).
11. If Return of Spontaneous Circulation is achieved refer to ROSC Protocol.

### Paramedic

1. Continue **ILS TREATMENT**.
2. Consider **MAGNESIUM SULFATE 25-50 mg/kg IV/IO** for Torsades de Pointes



# Cardiac Arrest

## PEARLS

- Special attention should be applied to the pediatric population and airway management / respiratory support. Given that the most likely cause of cardiac arrest is respiratory, airway management may be considered early in the patient's care.
- Early and effective CPR and defibrillation are the most important therapies for cardiac arrest care.
- Team Focused Approach / Pit-Crew Approach recommended; assign responders to predetermined tasks.
- Efforts should be directed at high quality and continuous compressions with limited interruptions and early defibrillation when indicated.
- Consider early IO placement if available and/or difficult IV access anticipated.

## Compressions

- Minimize interruptions in chest compression, as pauses rapidly return the blood pressure to zero and stop perfusion to the heart and brain.
- Chest compressions should be reinitiated immediately after defibrillation as pulses, if present, are often difficult to detect and rhythm and pulse checks interrupt compressions.
- Continue chest compressions between completion of AED analysis and AED charging.
- Effectiveness of chest compressions decreases with any movements and thus patients should be resuscitated as close to the point at which they are first encountered and should only be moved if the conditions on scene are unsafe or do not operationally allow for resuscitation.
- Performing manual chest compressions in a moving vehicle may pose a provider safety concern.

## Ventilation

- Avoid excessive ventilation. If no advanced airway in place (BIAD or ETT) compression to ventilation ratio is 30:2 for 1 person CPR or 15:2 for 2 person CPR. If advanced airway is in place, ventilate 10 breaths per minute (1 ventilation every 6 seconds) with continuous, uninterrupted compressions.
- Do not interrupt compression to place endotracheal tube. Consider BIAD first to limit interruptions.
- Reassess and document BIAD and/or endotracheal tube placement and EtCO<sub>2</sub> frequently, after every move, and at transfer of care.

## EtCO<sub>2</sub>

- Quantitative end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) should be used to monitor effectiveness of chest compressions.
  - a. EtCO<sub>2</sub> > 10 mmHg is indicative of quality CPR.
  - b. Abrupt sustained increase in EtCO<sub>2</sub> is indicative of potential ROSC.

## Defibrillation

- Follow manufacture's recommendations concerning defibrillation energy. If the manufacturer's recommendation is unknown, use the highest setting possible. First shock 2 J/kg; second shock 4 J/kg; subsequent shocks ≥ 4 J/kg (maximum 10 J/kg or adult dose).

# Cardiac Arrest

## PEARLS

### Special Circumstances

- **Respiratory Arrests** (Drowning / Suffocation / Asphyxiation / Hanging)
  - i. Prompt attention to airway and ventilation is priority followed by high-quality and continuous chest compressions and early defibrillation.
- **Asystole / PEA**
  - i. Survival from PEA or Asystole is based on identifying and correcting the CAUSE. Consider a broad differential diagnosis, with early and aggressive treatment of possible causes.

## KEY DOCUMENTATION ELEMENTS

- Resuscitation attempted and all interventions performed
- Arrest witnessed
- Location of arrest
- First monitored rhythm
- CPR before EMS arrival
- Outcome
- Any ROSC
- Presumed etiology (presumed cardiac, trauma, submersion, respiratory, other non-cardiac, unknown )

## PERTINENT ASSESSMENT FINDINGS

- The patient in cardiac arrest requires a prompt balance of treatment and assessment
- In cases of cardiac arrest, assessments should be focused and limited to obtaining enough information to reveal the patient is pulseless
- Once pulselessness is discovered, treatment should be initiated immediately and any further history must be obtained by bystanders while treatment is ongoing

## QUALITY METRICS

- Time to scene; Time to first CPR; Time to first intervention (shock / Epinephrine); Resuscitation Time; Time of ROSC
- Review of CPR Quality (Compression Fraction, Average and longest peri-shock pause, Rate and depth of compressions)
- Waveform capnography used for initial confirmation of advanced airway placement and continuous monitoring during transport
- Documentation of estimated weight in kilograms

# Return of Spontaneous Circulation

## History

- Respiratory arrest
- Cardiac arrest

## Signs and Symptoms

- Return of Spontaneous Circulation (ROSC) post cardiac arrest

## Differential

- Continue to address rhythm specific differentials

## EMR

1. Reassess Airway, Breathing and Circulation.
  - a. If ventilation assistance is required, ventilate at age appropriate respiratory rate.
  - b. Do not hyperventilate.
  - c. Titrate to maintain oxygen saturations  $\geq 94\%$ .
2. Provide **UNIVERSAL PATIENT CARE**.
3. Relay information to incoming ambulance.
4. Reassess patient. If patient becomes pulseless, begin CPR and follow CARDIAC ARREST Protocol.

## EMT-Basic

1. Continue **EMR TREATMENT**.
2. Perform 12-Lead ECG and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT**.
2. Obtain 12 Lead ECG, and transmit to receiving facility.
3. Treat hypotension according to SHOCK Protocol.
4. Monitor EtCO<sub>2</sub>. Target 35 - 40 mmHg.
5. If no advanced airway, consider placement of advanced airway per AIRWAY MANAGEMENT Protocol.
6. Initiate transport.

## Paramedic

1. Continue **ILS TREATMENT**.
2. If hypotension persists despite fluid administration, consider **DOPAMINE** at **5 mcg/kg/min** titrated to age appropriate SBP
  - a. See Dopamine Drip Chart

# Return of Spontaneous Circulation

## PEARLS

- Hyperventilation is a significant cause of hypotension and recurrence of cardiac arrest in the post resuscitation phase and must be avoided.
- Most patients immediately post resuscitation will require ventilatory assistance.
- The condition of post-resuscitation patients fluctuates rapidly and continuously, and they require close monitoring. A significant percentage of post-ROSC patients will re-arrest.
- A moderate number of post-ROSC patients may have evidence of ST elevation MI on ECG.
- Common causes of post-resuscitation hypotension include hyperventilation, hypovolemia, and pneumothorax.

## KEY DOCUMENTATION ELEMENTS

- Immediate post-arrest rhythms
- Vitals Signs
- Neurologic assessment
- Post-ROSC 12-lead ECG

## PERTINENT ASSESSMENT FINDINGS

- Asses post-ROSC rhythm, lung sounds and for signs of hypoperfusion

## QUALITY METRICS

- Percent of patient receiving a post-ROSC 12-lead ECG
- Documentation of estimated weight in kilograms

# Syncope / Pre-Syncope

## History

- History of prior syncopal episodes
- Cardiac history (CAD, CHF, Dysrhythmias)
- Stroke history
- Seizure history
- Recent trauma
- Occult blood loss (GI/GU)
- Fluid losses (Nausea, Vomiting, Diarrhea)
- Past medical history
- Medications

## Signs and Symptoms

- Loss of consciousness with recovery
- Lightheadedness / Dizziness
- Palpitations, slow or rapid pulse
- Pulse irregularity
- Decreased blood pressure

## Differential

- Vasovagal
- Orthostatic hypotension
- Cardiac syncope
- Micturition / Defecation syncope
- Psychiatric
- Stroke
- Hypoglycemia
- Seizure
- Shock (see Shock Protocol)
- Toxicological (Alcohol)
- Medication effect (Hypotension)
- PE
- AAA

## Definitions

**Syncope:** Loss of consciousness and postural tone that resolves spontaneously without medical interventions.

**Pre-Syncope:** Prodromal symptoms of syncope. Usually lasts for seconds to minutes and may be described by the patient as “nearly blacking out” or “nearly fainting”.

## EMR

1. **UNIVERSAL PATIENT CARE.**
2. If blood glucose < 60 mg/dL (or suspected), refer to DIABETIC EMERGENCIES Protocol.
3. Evaluate for hemorrhage and treat for shock if indicated. Refer to SHOCK Protocol.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Basic

1. Continue **EMR TREATMENT**.
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT**.
2. Obtain 12-Lead ECG and transmit to receiving facility.
3. Monitor for dysrhythmias closely. If dysrhythmia present, follow appropriate dysrhythmia protocol.

# Syncope / Pre-Syncope

## PEARLS

- Patients suffering syncope due to arrhythmia may suffer recurrent arrhythmia and should therefore be placed on a cardiac monitor.
- By being most proximate to the scene and to the patient's presentation, EMS providers are commonly in a unique position to identify the cause of syncope. Consideration of potential causes, ongoing monitoring of vitals and cardiac rhythm as well as detailed exam and history are essential pieces of information to pass onto hospital providers.
- All patients suffering from syncope deserve hospital level evaluation, even if they appear normal with few complaints on scene.
- High risk causes of syncope include the following:
  - a. Cardiovascular
    - i. Myocardial infarction
    - ii. Aortic stenosis
    - iii. Hypertrophic cardiomyopathy
    - iv. Pulmonary embolus
    - v. Thoracic aortic dissection
    - vi. Lethal dysrhythmia
  - b. Neurovascular
    - i. Intracranial hemorrhage
    - ii. Transient ischemic attack or stroke
- Consider high risk 12-lead ECG features including, but not limited to:
  - a. Evidence of QT prolongation (generally over 500ms).
  - b. Delta waves.
  - c. Brugada syndrome (incomplete RBBB pattern in V1/V2 with ST segment elevation).
  - d. Hypertrophic obstructive cardiomyopathy

## KEY DOCUMENTATION ELEMENTS

- Presenting cardiac rhythm
- Cardiac rhythm present when patient is symptomatic
- Any cardiac rhythm changes
- Full vital signs

## PERTINENT ASSESSMENT FINDINGS

- Evidence of trauma
- Evidence of cardiac dysfunction (e.g. evidence of CHF, arrhythmia)
- Evidence of hemorrhage
- Evidence of neurologic compromise
- Evidence of alternate etiology, including seizure
- Initial and ongoing cardiac rhythm
- 12-lead ECG findings

## QUALITY METRICS

- Acquisition of 12-lead ECG
- Application of cardiac monitor
- Blood glucose obtained
- Documentation of estimated weight in kilograms

# Tachycardia (with a Pulse)

## Narrow Complex ( $\leq 0.09$ sec)

### History

- Medications or Toxic Ingestion
- Diet (caffeine, chocolate)
- Drugs (nicotine, cocaine)
- Congenital heart disease
- Respiratory distress
- Past medical history
- History of palpitations / Heart racing
- Syncope / Near syncope

### Signs and Symptoms

- Tachycardia  
SVT - Infant  $> 220$ /min  
- Child  $> 180$ /min
- Pale or Cyanosis
- Diaphoresis
- Tachypnea
- Vomiting
- Hypotension
- Altered level of consciousness
- Syncope

### Differential

- Heart disease (Congenital)
- Hypo- / Hyperthermia
- Hypovolemia or Anemia
- Electrolyte imbalance
- Anxiety / Pain / Emotional stress
- Fever / Infection / Sepsis
- Hypoxia, Hypoglycemia
- Medication / Toxin / Drugs
- Pulmonary embolus
- Trauma, Tension pneumothorax

## EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Obtain 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **BLS TREATMENT**.
  - a. Obtain 12-Lead ECG within 10 minutes of patient contact and transmit to receiving.
2. Establish IV access - preferably large bore in AC.
3. Consider **NORMAL SALINE 20 mL/kg** fluid bolus (max 60 mL/kg) to rule out hypovolemia / dehydration as cause of tachycardia.

### SINUS TACHYCARDIA

*Infants: rate usually  $< 220$ /min & Children: rate usually  $< 180$ /min; P waves present / normal*

1. Identify and treat underlying cause.

### SUPRAVENTRICULAR TACHYCARDIA

*Infants: rate usually  $\geq 220$ /min & Children: rate usually  $\geq 180$ /min; P waves absent / abnormal*

### **STABLE** (No Cardiopulmonary compromise)

1. Perform vagal maneuvers.
  - a. In infants and children apply ice to the face. In older children perform Valsalva maneuvers.
2. **ADENOSINE 0.1 mg/kg (max 6 mg) rapid IV/IO push** followed by a rapid flush.
3. If no change in rhythm give **ADENOSINE 0.2 mg/kg rapid IV/IO push** followed by a rapid flush.

### **UNSTABLE** (Cardiopulmonary compromise)

1. Immediate SYNCHRONIZED CARDIOVERSION at **0.5 - 1 J/kg**.
  - a. If normal LOC, consider sedation with **MIDAZOLAM 0.1 mg/kg IV/IO/IN** (maximum dose 2 mg) before SYNCHRONIZED CARDIOVERSION. Do not delay cardioversion to sedate.
2. If no response to initial energy dose, SYNCHRONIZED CARDIOVERSION at **2 J/kg**.
3. If cardioversion is successful obtain 12-Lead ECG.

# Tachycardia (with a Pulse)

## Wide Complex (> 0.09 sec)

### History

- Medications or Toxic Ingestion
- Diet (caffeine, chocolate)
- Drugs (nicotine, cocaine)
- Congenital heart disease
- Respiratory distress
- Past medical history
- History of palpitations / Heart racing
- Syncope / Near syncope

### Signs and Symptoms

- Tachycardia  
  Infant > 220/min  
  Child > 180/min
- Pale or Cyanosis
- Diaphoresis
- Tachypnea
- Vomiting
- Hypotension
- Altered level of consciousness
- Syncope
- Diaphoresis

### Differential

- Heart disease (Congenital)
- Hypo- / Hyperthermia
- Hypovolemia or Anemia
- Electrolyte imbalance
- Anxiety / Pain / Emotional stress
- Fever / Infection / Sepsis
- Hypoxia, Hypoglycemia
- Medication / Toxin / Drugs
- Pulmonary embolus
- Trauma, Tension pneumothorax

## EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Perform 12-lead ECG within 10 minutes of patient contact and transmit to receiving facility (if available).
3. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **BLS TREATMENT**.
  - a. Obtain 12-Lead ECG within 10 minutes of patient contact and transmit to receiving facility.
2. Establish IV access - preferably large bore in AC.
3. Consider **NORMAL SALINE 20 mL/kg IV bolus** to rule out hypovolemia/dehydration as cause of tachycardia. Repeat fluid bolus as needed as long as lungs remain clear; maximum **60 mL/kg**.

### STABLE

1. If regular rhythm and monomorphic QRS, consider **ADENOSINE 0.1 mg/kg (max 6 mg) rapid IV/IO push** followed by a rapid flush.
  - a. If no change in rhythm, may repeat **ADENOSINE 0.2 mg/kg (max 12 mg) rapid IV/IO push** followed by a rapid flush.
2. If no change or not monomorphic and regular, administer **AMIODARONE 5 mg/kg (max 150 mg) IV/IO over 20-60 minutes** -OR- **LIDOCAINE 1 mg/kg IV/IO**.

### UNSTABLE

1. If cardiopulmonary compromise, immediate SYNCHRONIZED CARDIOVERSION at **0.5 - 1 J/kg**.
  - a. If normal LOC, consider sedation with **MIDAZOLAM 0.1 mg/kg IV/IO/IN (max 2 mg)** before SYNCHRONIZED CARDIOVERSION. Do not delay cardioversion to sedate.
2. If no response to initial energy dose and pulse present, SYNCHRONIZED CARDIOVERSION at **2 J/kg**.
3. If cardioversion is successful obtain 12-Lead ECG.
4. If the patient becomes pulseless at any time, refer to the CARDIAC ARREST and/or V-FIB/PULSELESS V-TACH Protocol.

## Paramedic

1. Continue **ILS Treatment**
2. Consider **MAGNESIUM SULFATE 25-50 mg/kg IV/IO (max 2 grams)** over 10 minutes for Polymorphic V-Tach / Torsades de Pointes



# Tachycardia (with a Pulse)

## PEARLS

**Unstable / Cardiopulmonary Compromise:** Respiratory distress / failure, Hypotension (late sign), AMS, signs of shock.

**Regular Narrow Complex Tachycardia** ( $\leq 0.09$  seconds)

- Sinus Tachycardia: P waves present. Variable R-R waves. Infants usually  $< 220$  beats / minute. Children usually  $< 180$  beats / minute.
- SVT:  $> 90\%$  of children with SVT will have a narrow QRS seconds. P waves absent or abnormal. R-R waves not variable. Usually abrupt onset. Infants usually  $> 220$  beats / minute. Children usually  $> 180$  beats / minute.

**Wide Complex Tachycardia** ( $> 0.09$  seconds)

- SVT with aberrancy
- Ventricular tachycardia: Uncommon in children. Rates may vary from near normal to  $> 200$  / minute. Most children with VT have underlying heart disease / cardiac surgery / long QT syndrome / cardiomyopathy.

**Torsades de Pointes / Polymorphic Tachycardia:** Rate is typically 150 to 250 beats / minute. Associated with long QT syndrome, hypomagnesaemia, hypokalemia, many cardiac drugs. May quickly deteriorate to VT. Magnesium sulfate is the treatment of choice.

- Consider causes for tachycardia (Hypovolemia, Hypoxia, Hydrogen (acidosis), Myocardial infarction, Hypokalemia / hyperkalemia, Hypoglycemia, Hypothermia, Toxins / Overdose, Tamponade, Tension, Pneumothorax , Thrombus – central or peripheral, Trauma, Hyperthyroidism)
- Studies in infants and children have demonstrated the effectiveness of adenosine for the treatment of hemodynamically stable or unstable SVT.
- A wide-complex irregular rhythm should be considered pre-excited atrial fibrillation; extreme care must be taken in these patients
  - a. Characteristic ECG findings include a short PR interval and, in some cases, a delta wave
  - b. Avoid AV nodal blocking agents such as adenosine, calcium channel blockers, digoxin, and possibly beta-blockers in patients with pre-excitation atrial fibrillation (e.g. Wolff-Parkinson-White Syndrome, Lown-Ganong-Levine Syndrome) because these drugs may cause a paradoxical increase in the ventricular response.
  - c. Blocking the AV node in some of these patients may lead to impulses that are transmitted exclusively down the accessory pathway, which can result in ventricular fibrillation.

## KEY DOCUMENTATION ELEMENTS

- Initial rhythm and all rhythm changes
- Time, dose and response to meds given
- Cardioversion times, attempts, joules and response
- Obtain monitor strips after each intervention

## PERTINENT ASSESSMENT FINDINGS

- 

## QUALITY METRICS

- Correct medication and dose given
- Correct cardioversion joules delivered
- Documentation of estimated weight in kilograms

# Tachycardia (with a Pulse)

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# Newborn Care / Neonatal Resuscitation

## History

- Due date and gestational age
- Multiple gestation (twins, etc.)
- Meconium / Delivery difficulties
- Congenital disease
- Medications (maternal)
- Maternal risk factors such as substance abuse or smoking

## Signs and Symptoms

- Respiratory distress
- Peripheral cyanosis or mottling (normal)
- Central cyanosis (abnormal)
- Altered level of responsiveness
- Bradycardia

## Differential

- Airway failure
  - Secretions
  - Respiratory drive
- Infection
- Maternal medication effect
- Hypovolemia, Hypoglycemia, Hypothermia
- Congenital heart disease

## EMR & EMT-Basic

1. If immediate resuscitation is required and the newborn is still attached to the mother, clamp the cord in two places and cut between the clamps. If no resuscitation is required, warm / dry / stimulate the newborn and then cut / clamp the cord after 60 seconds or the cord stops pulsating.
2. Record APGAR scores at 1 and 5 minutes.
3. Warm, dry, and stimulate.
  - a. Wrap infant in dry towel or thermal blanket to keep infant as warm as possible during resuscitation; keep head covered if possible.
  - b. If strong cry, regular respiratory effort, good tone, and term gestation, infant should be placed skin-to-skin with mother and covered with dry linen.
4. If weak cry, signs of respiratory distress, poor tone, or preterm gestation then position airway (sniffing position) and clear airway as needed - if thick meconium or secretions present *and* signs of respiratory distress, suction mouth then nose.
5. If heart rate **greater than 100 beats** per minute.
  - a. Monitor for central cyanosis - provide blow-by oxygen as needed.
  - b. Monitor for signs of respiratory distress. If apneic or in significant respiratory distress:
    - i. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute.
6. If heart rate **less than 100 beats** per minute
  - a. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute.
    - i. Primary indicator of effective ventilation is improvement in heart rate.
    - ii. Rates and volumes of ventilation required can be variable, only use the minimum necessary rate and volume to achieve chest rise and a change in heart rate
  - b. If no improvement after 90 seconds, change oxygen delivery to 100% FiO<sub>2</sub> until heart rate normalizes
7. If heart rate **less than 60 beats** per minute
  - a. Ensure effective ventilations with supplementary oxygen and adequate chest rise.
  - b. If no improvement after 30 seconds, initiate chest compressions - two-thumb-encircling-hands technique is preferred.
  - c. Coordinate chest compressions with positive pressure ventilation (3:1 ratio, 90 compressions and 30 breaths per minute).
8. Consider checking a blood glucose for ongoing resuscitation, maternal history of diabetes, ill appearing or unable to feed.
9. Relay information to incoming ambulances or call for intercept per INTERCEPT CRITERIA.

Protocol Continues

# Newborn Care / Neonatal Resuscitation

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS Treatment**.
2. If heart rate **less than 60 beats** per minute despite ventilations and chest compressions:
  - a. Continue ventilations and chest compressions and consider endotracheal intubation.
  - b. Administer **EPINEPHRINE (1:10,000) 0.01 mg/kg IV/IO** (preferable if access obtained) or 0.1 mg/kg via the ETT (if unable to obtain access).
3. Administer **NORMAL SALINE 20 mL/kg IV/IO** for signs of shock or post-resuscitative care.

APGAR Score			
Sign	0	1	2
Appearance	Blue, Pale	Body pink, Extremities blue	Completely pink
Pulse	Absent	< 100	> 100
Grimace	No response	Grimace	Cough or Sneeze
Activity	Limp	Some flexion	Active motion of extremities
Respirations	Absent	Slow, Irregular	Good, Crying

# Newborn Care / Neonatal Resuscitation

## PEARLS

- Newborn infants are prone to hypothermia which may lead to hypoglycemia, hypoxia and lethargy. Aggressive warming techniques should be initiated including drying, swaddling and warm blankets covering body and head.
- Raise temperature in ambulance patient compartment.
- Approximately 10% of newly born infants require some assistance to begin breathing.
- Deliveries complicated by maternal bleeding (placenta previa, vas previa, or placental abruption) place the infant at risk for hypovolemia secondary to blood loss.
- Low birth weight infants are at high risk for hypothermia due to heat loss.
- If pulse oximetry is used as an adjunct, the preferred placement place of the probe is the right arm, preferably wrist or medial surface of the palm. Normalization of blood oxygen levels (SaO<sub>2</sub> 85-95%) will not be achieved until approximately 10 minutes following birth.
- Both hypoxia and excess oxygen administration can result in harm to the infant. If prolonged oxygen use is required, titrate to maintain an oxygen saturation of 85-95%.
- While not ideal, a larger facemask than indicated for patient size may be used to provide bag-valve-mask ventilation if an appropriately sized mask is not available - avoid pressure over the eyes as this may result in bradycardia.
- Increase in heart rate is the most reliable indicator of effective resuscitative efforts.
- A multiple gestation delivery may require additional resources and/or providers.
- During transport, neonate should be appropriately secured in seat or isolette and mother should be appropriately secured.

## KEY DOCUMENTATION ELEMENTS

- Document full vital signs and physical findings
- Historical elements
  - Prenatal complications
  - Delivery complications
  - Date and time of birth
  - Estimated gestational age

## PERTINENT ASSESSMENT FINDINGS

- If there is any doubt as to viability, resuscitation efforts should be initiated
- Acrocyanosis, a blue discoloration of the distal extremities, is a common finding in the newly born infant transitioning to extrauterine life—this must be differentiated from central cyanosis

## QUALITY METRICS

- Time to initiation of interventions
- Use of oxygen during resuscitation
- Number of advanced airway attempts
- Documentation of estimated weight in kilograms

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# Initial Trauma Care

## All Levels

### PRIMARY SURVEY:

#### Scene Size-Up

1. Ensure scene safety – identify any hazards.
2. Determine the number of patients.
3. Identify the mechanism of injury.
4. Call for additional resources if needed.

#### Initial Assessment

1. Obtain a general impression of the patient's condition.
2. Hemorrhage control
  - a. Assess for and stop severe hemorrhage. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
3. Airway
  - a. Assess airway patency by asking the patient to talk to assess stridor and ease of air movement.
  - b. Establish patent airway with cervical spine precautions as needed, per the AIRWAY MANAGEMENT and SPINAL MOTION RESTRICTION Protocol.
  - c. Look for injuries that may lead to airway obstruction including unstable facial fractures, expanding neck hematoma, blood or vomitus in the airway, facial burns / inhalation injury.
  - d. Evaluate mental status for ability to protect airway (patients with a GCS less than or equal to 8 are likely to require airway protection).
4. Breathing
  - a. Assess respiratory rate and pattern.
  - b. Assess symmetry of chest wall movement.
  - c. Listen bilaterally for breath sounds. If absent or diminished breath sounds in a hypotensive patient, consider tension pneumothorax and perform NEEDLE DECOMPRESSION (ILS/ALS ONLY)
  - d. For open chest wound, place occlusive dressing.
  - e. Monitor oxygen saturation & EtCO<sub>2</sub> and, if indicated, provide supplemental **Oxygen**.
5. Circulation
  - a. Assess blood pressure and pulses noting rate, rhythm and quality.
  - b. Assess skin color, temperature and condition.
  - c. Establish IV access. If child demonstrates tachycardia for age with signs of poor perfusion (*hypotension, > 2 sec capillary refill, AMS, hypoxia, weak pulses, pallor or mottled/cool skin*) administer **IV Fluid 20 mL/kg** to maintain age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP. **(ILS/ALS ONLY)**
6. Disability
  - a. Asses Level of Consciousness:  
**A** – Alert; **V** – Responds to verbal; **P** – Responds to pain; **U** – Unresponsive
7. Exposure
  - a. Rapid evaluation of entire body to identify sites of penetrating wounds or other blunt injuries. Be sure to roll patient and examine the back.
  - b. Prevent hypothermia (remove wet clothing and cover patient to prevent further heat loss).
8. **Critical Transport Decision** - Refer to REGION 6 TRAUMA TRIAGE ALGORITHM
  - a. Limit scene time to 10 minutes or less if the patient meets category A or B criteria.

Protocol Continues

# Initial Trauma Care

## All Levels

### SECONDARY SURVEY:

#### **SAMPLE History**

- Signs and Symptoms
- Allergies
- Medications
- Past medical history, injuries, illnesses
- Last meal / intake
- Events leading up to the injury and/or illness

#### **Head to Toe Physical Exam**

*(Evaluate for: DCAP-BTLS TIC—Deformities, Contusions, Abrasions, Puncture / Penetration / Paradoxical Movement - Burns, Tenderness, Laceration, Swelling - Tenderness, Instability, Crepitus)*

1. Head
  - a. Palpate head, scalp and face and evaluate for soft tissue injury or bony crepitus.
  - b. Assess pupils.
2. Neck
  - a. Examine for contusions, abrasions, hematomas, lacerations, crepitus, JVD, or tracheal deviation.
  - b. Palpate the c-spine for deformity and tenderness. Refer to SPINAL MOTION RESTRICTION Protocol.
3. Chest
  - a. Palpate for instability / crepitus and look for flail segments or paradoxical movements.
  - b. Listen to breath sounds.
  - c. Inspect for penetrating or soft tissue injuries.
4. Abdomen
  - a. Palpate for tenderness.
  - b. Inspect for penetrating or soft tissue injuries.
5. Pelvis
  - a. Inspect for penetrating or soft tissue injuries.
  - b. Palpate once for instability by applying medial pressure on the iliac crests bilaterally.
6. Back
  - a. Maintain spinal alignment and log roll with a minimum of 2 rescuers.
  - b. Inspect for penetrating or soft tissue injuries.
  - c. Immobilize if applicable per the SPINAL MOTION RESTRICTION Protocol.
7. Neurologic status assessment
  - a. Calculate Glasgow Coma Scale (GCS).
  - b. Serial assessment of mental status.
  - c. Gross exam of motor, strength, and sensation in all four extremities.
8. Extremities
  - a. Assess for fracture / deformity.
  - b. Assess peripheral pulses / capillary refill.

Protocol Continues 



# Initial Trauma Care

## All Levels

### ONGOING ASSESSMENT:

**Monitoring and Reassessment** (*seriously ill or injured patients should be reassessed every 5 min.*)

1. Reassess mental status (LOC, Pupils, GCS).
2. Reassess ABC's.
3. Reassess identified injuries (change in status, PMS).
4. Reassess and evaluate effectiveness of interventions.

### ADDITIONAL TREATMENT CONSIDERATIONS:

1. Maintain spine precautions per the SPINAL MOTION RESTRICTION Protocol.
2. Splint obvious extremity fractures per the EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
3. Provide pain medication per the PAIN MANAGEMENT Protocol.

PEDIATRIC GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Verbal	3
	To Pain	2
	None	1
Verbal Response	Oriented (Smiles, coos, oriented to sounds, interacts)	5
	Confused (Cries but consolable, Irritable)	4
	Inappropriate Words (Inconsolable, Persistent Crying)	3
	Incomprehensible Sounds (Moans to Pain)	2
	None (No vocalization)	1
Best Motor Response	Obeys Commands (normal spontaneous movements)	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain (decorticate)	3
	Extension to Pain (decerebrate)	2
	None	1

Normal Pediatric Vital Signs			
Age	Pulse	Systolic BP	Respiratory Rate
Neonate (0-1 mo)	100-180	>60	30-60
Infant (1-12 mo)	100-160	>70	30-60
Toddler (1-3 yrs)	90-150	>70 + (age in yrs x 2)	24-40
Pre-School (3-5 yrs)	80-140	>70 + (age in yrs x 2)	22-34
School Age (5-12 yrs)	70-120	>70 + (age in yrs x 2)	18-30
Adolescent (12-18 yrs)	60-100	>90	12-20

\*\*Created based off of Illinois EMSC Guidelines

# Initial Trauma Care

## PEARLS

- Optimal trauma care requires a structured approach to the patient emphasizing ABCDE (Airway, Breathing, Circulation, Disability, Exposure).
- Target scene time less than 10 minutes for unstable patients or those likely to need surgical intervention.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat neurologic status assessment.
  - a. If patient develops difficulty with ventilation, reassess breath sounds for development of tension pneumothorax.
  - b. If extremity hemorrhage is controlled with pressure dressing or tourniquet, reassess for evidence of continued hemorrhage.
  - c. If mental status declines, reassess ABCs and repeat neurologic status assessment.
  - d. Patients with compensated shock may not manifest hypotension until severe blood loss has occurred.
- Life-threatening injuries identified on primary survey should be managed immediately with rapid transport to a trauma center, while the secondary survey is performed enroute.
- Patients with traumatic brain injury may deteriorate as intracranial swelling and hemorrhage increase.
- Anticipate potential for progressive airway compromise in patients with trauma to head and neck.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and neurologic assessments
- Scene time
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Primary Survey
- Secondary Survey
- Ongoing Assessment

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Documentation of estimated weight in kilograms

# Region 6 Trauma Triage Algorithm

## Region 6 Trauma Triage Algorithm

When in doubt, take patient to an appropriate Trauma Center.

Measure signs and level of consciousness and assess for major injury.

For Patients Meeting Category A or B Criteria: Initiate Rapid Transport with Maximum of 10 Minute Scene Time

Airway Compromise or Management by a Basic Level EMS Provider without Mutual Aid Should be Transported to the Nearest Facility

### Category A:

- GCS Less than or equal to 10
- Systolic BP less than 90 (Adult), 80 (Peds) with mechanism or exam findings suggesting ongoing blood loss
- Paralysis (spine)
- Uncontrolled Bleeding
- Penetrating injuries to abdomen, back, chest or neck and suspicion of significant injury
- Burns >24% surface area, or involving face/airway not meeting other Category A criteria (Direct to Burn Center)
- Salvageable amputation proximal to wrist or ankle not meeting other Category A criteria (Direct To Reimplant Center)
- Unstable Pelvic Fracture
- Pulseless Extremity
- Cardiac Tamponade or Tension Pneumothorax

YES

#### STRONGLY RECOMMEND:

Transport to Level I Trauma Center or Specialty Center per Protocol

Alert Trauma Team; Consider Helicopter Transport if Quicker and of Clinical Benefit.

NO:

Assess for other injuries.

### Category B:

- LOC greater than 5 minutes and GCS 11-12
- Respiratory rate less than 10 or greater than 29
- Head injury with seizure activity, unilaterally dilated pupil or open/depressed skull fracture
- Full arrest not meeting Field Death Criteria
- Penetrating injuries with capability to work up/correct

#### High Risk Vehicular Crash:

- \*Rollover with unbelted passengers
- \*Ejection from crash
- \*Death in same passenger compartment
- \*Auto v. pedestrian/bicyclist thrown or run over
- \*Motorcycle crash with separation of rider and bike.
- Falls greater than 20 ft or 2-3 times patient's height if child
- Flail Chest/Chest wall instability
- Two or more proximal long bone fractures

YES

#### STRONGLY RECOMMEND:

Transport to center capable of providing definitive care (surgery if needed); alert trauma team; consider helicopter transport if quicker and of clinical benefit.

NO

Transport According to Trauma Protocols

# Region 6 Trauma Triage Algorithm

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# Abdominal Injuries

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Bleeding
- Evidence for multi-trauma
- Past medical history
- Medications

## Signs and Symptoms

- Pain
- Nausea / Vomiting
- Bruising and/or bleeding
- Distention
- Evisceration
- Altered mental status or unconscious
- Hypotension or shock
- Arrest

## Differential

- Blunt vs penetrating trauma
- Intra-abdominal bleeding
- Evisceration
- Pelvis / Femur fracture

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Control bleeding.
3. Treat any obvious abdominal injuries as indicated:
  - a. **Evisceration:** Cover the organs with a saline-soaked sterile dressing. Do not attempt to put the organs back into the abdomen.
  - b. **Impaled Objects:** Stabilize object with a bulky dressing. Do not attempt to remove an impaled object.
  - c. **Penetrating Wounds:** Cover with saline-soaked sterile dressing. Look for potential exit wounds.
  - d. **Blunt Trauma:** Continue to assess for clinical change (pain, distension, bruising, etc.)
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **IV Fluid 20 mL/kg** to maintain age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP.
4. Consider management of pain per the PAIN MANAGEMENT Protocol.
5. Consider management of nausea/vomiting per the NAUSEA / VOMITING Protocol.

# Abdominal Injuries

## PEARLS

- Trauma to the abdomen is either blunt or penetrating.
- Blunt injuries are harder to detect and diagnose and have a higher mortality rate.
- Key signs and symptoms of blunt trauma include a patient in shock with no obvious injuries.
- Distention of the abdomen is an indication of internal hemorrhage. (Pain may not be a significant factor)
- Many abdominal trauma injuries are Load & Go cases.
- Target scene time less than 10 minutes.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat abdominal exams.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and abdominal assessments
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Repeat abdominal exams
- Evaluate for exit wounds with penetrating injuries

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center

# Blast Injuries

## History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

## Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension / Shock
- Airway compromise / Respiratory distress

## Differential

- Superficial (1<sup>st</sup> Degree) red and painful
- Partial Thickness (2<sup>nd</sup> Degree) blisters
- Full Thickness (3<sup>rd</sup> Degree) painless/charred or leathery skin
- Thermal injury
- Chemical injury
- Electrical injury
- Radiation injury

## All Levels

1. Hemorrhage control
  - a. Assess for and stop severe hemorrhage. Refer to EXTREMITY TRAUMA / EXTERNAL HEMORRHAGE MANAGEMENT Protocol.
2. Airway
  - a. Assess airway patency and consider possible thermal or chemical airway burns.
  - b. Establish patent airway with cervical spine precautions, per the AIRWAY MANAGEMENT Protocol and SPINAL MOTION RESTRICTION Protocol.
  - c. If thermal or chemical burns to airway are suspected, early airway control is vital.
3. Breathing
  - a. Evaluate adequacy of respiratory effort, oxygenation, quality of lung sounds and chest wall integrity.
  - b. Listen bilaterally for breath sounds. Consider possible pneumothorax or tension pneumothorax (as a result of penetrating / blunt trauma or barotrauma).
  - c. If absent or diminished breath sounds in a hypotensive patient, consider tension pneumothorax and perform NEEDLE DECOMPRESSION (ILS/ALS ONLY)
  - d. For open chest wound, place occlusive dressing.
  - e. Monitor oxygen saturation and EtCO<sub>2</sub>. If indicated, provide supplemental **Oxygen**.
4. Circulation
  - a. Assess blood pressure and pulses noting rate, rhythm and quality.
  - b. Assess skin color, temperature and condition.
  - c. Establish IV access. If child demonstrates tachycardia for age with signs of poor perfusion (*hypotension, > 2 sec capillary refill, AMS, hypoxia, weak pulses, pallor or mottled/cool skin*) administer **IV Fluid 20 mL/kg** to maintain age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP. **(ILS/ALS ONLY)**
5. Disability
  - a. Assess level of consciousness (AVPU).
  - b. If evidence of head injury, treat per the HEAD INJURY Protocol.
  - c. Apply spinal precautions, per the SPINAL MOTION RESTRICTION Protocol.
6. Exposure
  - a. Rapid evaluation of entire body to identify sites of penetrating wounds, blunt injuries or burns. Be sure to roll patient and examine the back.
  - b. Keep patient warm to prevent hypothermia.
  - c. If patient has burns, refer to BURNS Protocol.

# Blast Injuries

## PEARLS

- Ensuring scene safety is especially important at the scene of an explosion.
  - a. Consider possibility of subsequent explosions, structural safety, possible toxic chemical contamination, the presence of noxious gasses, and other hazards.
  - b. In a possible terrorist event, consider the possibility of secondary explosive devices
- Remove patient from the scene as soon as is practical and safe.
- Patients sustaining blast injury may sustain complex, multi-system injuries including: blunt and penetrating trauma, shrapnel, barotrauma, burns, and toxic chemical exposure.
- Consideration of airway injury, particularly airway burns, should prompt early and aggressive airway management.
- Minimize IV fluid resuscitation in patients without signs of shock.
- Consider injuries due to barotrauma:
  - a. Tension pneumothorax
    - i. Hypotension or other signs of shock associated with decreased or absent breath sounds, jugular venous distension, and/or tracheal deviation.
  - b. Tympanic membrane perforation resulting in deafness which may complicate the evaluation of their mental status and their ability to follow commands.
- **Types of Blast Injury:**
  - a. Primary Blast Injury: From pressure wave.
  - b. Secondary Blast Injury: Impaled objects. Debris which becomes missiles / shrapnel. (Most common cause of death)
  - c. Tertiary Blast Injury: Patient falling or being thrown / pinned by debris.

## KEY DOCUMENTATION ELEMENTS

- Airway status and intervention
- Breathing status (Oxygenation, respiratory effort)
- Documentation of burns, including TBSA
- Documentation of possible toxic chemical contamination

## PERTINENT ASSESSMENT FINDINGS

- Evidence of multi-system trauma, especially:
  - a. Airway injury / burn
  - b. Barotrauma to lungs
  - c. Toxic chemical contamination

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Airway assessment and early and aggressive management
- Documentation of estimated weight in kilograms



# Burns

## (Thermal, Chemical, Electrical, Inhalation)

### History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

### Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension / Shock
- Airway compromise / distress
- Singed facial or nasal hair
- Hoarseness / Wheezing

### Differential

- Superficial (1<sup>st</sup> Degree) red and painful
- Partial Thickness (2<sup>nd</sup> Degree) blisters
- Full Thickness (3<sup>rd</sup> Degree) painless/charred or leathery skin
- Thermal burns
- Chemical burns
- Electrical burns
- Radiation injury

## EMR & EMT-Basic

### General Treatment:

1. Assure scene and rescuer safety.
2. **INITIAL TRAUMA CARE.**
3. Expose the burned area and remove any rings, bracelets or other constricting items.
4. Estimate Total Body Surface Area (TBSA) and depth of burn.
  - a. Use "Rule of 9's".
  - b. First-degree (superficial) burns (skin erythema only) are not included in TBSA calculations.
5. If evidence of possible airway burn (burns around face, nares or pharynx), consider aggressive airway management per the AIRWAY MANAGEMENT Protocol.
6. Evaluate distal circulation in circumferentially burned extremities.
7. Prevent systemic heat loss and keep the patient warm.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

### Thermal Burns:

1. Stop the burning process with sterile water or normal saline.
  - a. Remove non-adherent clothing and jewelry.
  - b. Leave blisters intact.
2. Minimize burn wound contamination.
  - a. Cover burns with dry dressing or clean sheet.
  - b. Do not apply gels or ointments.
3. Consider carbon monoxide and/or cyanide poisoning in patients with smoke inhalation. Refer to CARBON MONOXIDE / SMOKE INHALATION and CYANIDE POISONING Protocols.

### Chemical Burns:

1. If dry chemical contamination, carefully brush off solid chemical prior to flushing the site.
2. If wet chemical contamination, flush the patient's skin (and eyes, if involved) with copious amounts of water or normal saline.
3. For eye exposure, administer continuous flushing of Normal Saline fluid to eye.

### Electrical Burns:

1. Verify scene safety and ensure that the electrical source is disabled prior to assessment.
2. Assess for visible entrance and exit wounds and treat as thermal burns.
3. Immobilize if associated trauma suspected. Refer to SPINAL MOTION RESTRICTION Protocol.
4. Determine characteristics - AC or DC, voltage, amperage, time of injury

Protocol Continues

# Burns

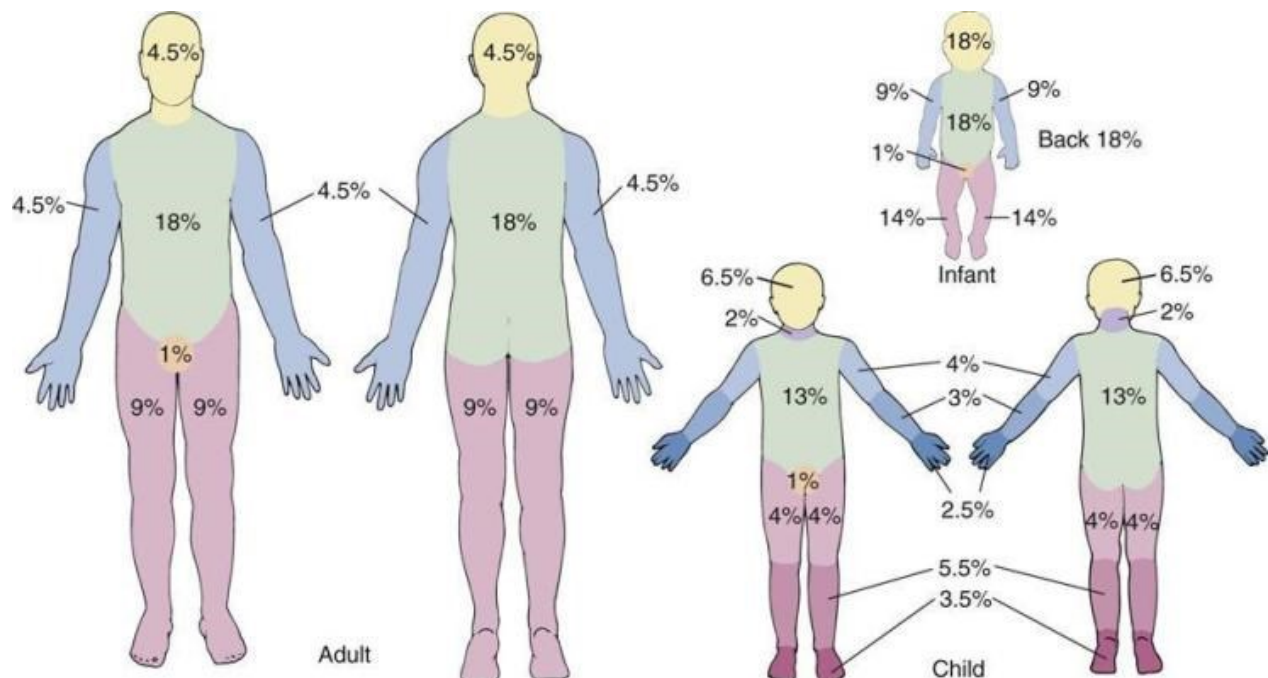
## (Thermal, Chemical, Electrical, Inhalation)

### EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Apply cardiac monitor and assess for dysrhythmias, especially in electrical injuries.
3. Establish IV access. Avoid placement through burned skin.
4. Administer **IV Fluid 20 ml/kg IV** to age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP.
5. Consider the need for an advanced airway if signs of inhalation injury (burns around face, nares or pharynx) are present per the AIRWAY MANAGEMENT Protocol.
6. Consider early management of pain per the PAIN MANAGEMENT Protocol.

### Rule of Nine's

**% Partial Thickness + % Full Thickness = % Total Burn Surface Area (TBSA)**



# Burns

## (Thermal, Chemical, Electrical, Inhalation)

### PEARLS

- Onset of stridor and change in voice are sentinel signs of potentially significant airway burns, which may rapidly lead to airway obstruction or respiratory failure. Early intubation is required in significant inhalation injuries.
- EtCO<sub>2</sub> monitoring may be particularly useful to monitor respiratory status in patients receiving significant doses of narcotic pain medication.
- Particularly in enclosed-space fires, carbon monoxide toxicity is a consideration and pulse oximetry may not be accurate.
- Cardiac monitor is important in electrical burns and chemical inhalations.
- Have a high index of suspicion for cyanide poisoning in a patient with depressed GCS, respiratory difficulty and cardiovascular collapse in the setting of an enclosed-space fire. Give the antidote (hydroxocobalamin), if available, in this circumstance.
- Pain management is critical in acute burns.
- TBSA is calculated only based on percent of second (partial thickness) and third degree (full thickness) burns – First degree (superficial) burns are not included in this calculation.
- Burn patients are prone to hypothermia—never apply ice or cool burns that involve > 10% TBSA.
- Burn patients are trauma patients; evaluate for multisystem trauma.
- Anticipate atrial and/or ventricular dysrhythmias as well as cardiac arrest with electrical injuries.
- The mortality related to electrical injuries is impacted by several factors:
  - a. Route current takes through the body – current traversing the heart has higher mortality.
  - b. Type of current – AC vs. DC
    - i. AC is more likely to cause cardiac dysrhythmias while DC is more likely to cause deep tissue burns however either type of current can cause any injury.
    - ii. DC typically causes one muscle contraction while AC can cause repeated contractions.
    - iii. Both types of current can cause involuntary muscle contractions that do not allow the victim to let go of the electrical source.
    - iv. AC is more likely to cause ventricular fibrillation while DC is more likely to cause asystole.
- For chemical burns: Normal Saline or Sterile Water is preferred, however if not available, do not delay irrigation and use tap water. Other water sources may be used based on availability. Flush the area as soon as possible with the cleanest readily available water or saline solution using copious amounts of fluids.

### KEY DOCUMENTATION ELEMENTS

- Initial airway status
- Total volume of fluid administered
- TBSA of second and third degree burns
- Pulse and capillary refill exam distally on any circumferentially burned extremity
- Pain management

### PERTINENT ASSESSMENT FINDINGS

- Consider related trauma in addition to burns
- Consider inhalation exposures such as CO and CN
- If evidence of possible airway burn, consider aggressive airway management
- Estimate TBSA burned and depth of burn

### QUALITY METRICS

- Patient transported to most appropriate hospital
- Pain appropriately managed
- Airway assessment and early and aggressive management, especially with burns to face, nares or pharynx
- Documentation of estimated weight in kilograms

# Burns

**(Thermal, Chemical, Electrical, Inhalation)**

**Intentionally Left  
Blank**

# Chest Injuries

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Bleeding
- Evidence for multi-trauma
- Past medical history
- Medications

## Signs and Symptoms

- Shortness of breath / Dyspnea
- Chest pain
- Cyanosis
- Absent / Diminished breath sounds
- Hypotension / Shock
- Paradoxical chest wall movement
- Bruising over sternum

## Differential

- Simple pneumothorax
- Tension pneumothorax
- Flail chest
- Open chest wound
- Hemothorax
- Traumatic asphyxia
- Cardiac tamponade

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Control bleeding.
3. Treat any obvious chest injuries as indicated:
  - a. **Open Chest Wound:** Apply occlusive dressing, leaving one side / corner open. Monitor for tension pneumothorax.
  - b. **Impaled Objects:** Stabilize object with a bulky dressing. Do not attempt to remove an impaled object.
  - c. **Flail Chest:** Stabilize with a bulky dressing.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Establish IV access and administer **IV Fluid 20 mL/ kg IV** to maintain age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP.
3. Treat any obvious chest injuries as indicated (including above):
  - a. **Tension Pneumothorax:** Perform NEEDLE DECOMPRESSION.
    - i. Signs and symptoms: Hypotension or other signs of shock associated with decreased or absent breath sounds, JVD and/or tracheal deviation.
  - b. **Flail Chest:** For massive flail chest with severe respiratory compromise, consider advanced airway per the AIRWAY MANAGEMENT Protocol.
4. Apply cardiac monitor and perform 12-lead ECG.
5. Consider management of pain per the PAIN MANAGEMENT Protocol.

# Chest Injuries

## PEARLS

- Chest pain due to blunt trauma may be an indication of underlying injury.
- Blunt injuries such as pulmonary contusion and cardiac contusion may cause respiratory insufficiency and/or myocardial infarction. Acquire and transmit 12-lead ECG.
- If tension pneumothorax develops in a patient with a sealed sucking chest wound, attempt to resolve by releasing air from the seal prior to decompressing chest.
- Chest decompression is only indicated for a true tension pneumothorax. It is not appropriate to needle decompress a simple pneumothorax.
- Target scene time less than 10 minutes.
- Transport destination is based on the REGION 6 TRAUMA TRIAGE ALGORITHM Protocol.
- Transport should not be delayed for procedures; ideally procedures should be performed enroute when possible.
- Frequent reassessment of the patient is important. Monitor patient for deterioration over time with serial vital signs and repeat neurologic status assessment.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and neurologic assessments
- Procedures performed and patient response

## PERTINENT ASSESSMENT FINDINGS

- Signs and symptoms of tension pneumothorax
- Airway and respiratory assessment
- Consider underlying cardiac injury and apply cardiac monitor

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Airway assessment and management appropriately documented
- Documentation of estimated weight in kilograms

# Crush Injuries

## History

- Entrapped and crushed under heavy load > 60 minutes
- Extremity / Body crushed
- Building collapse, trench collapse, industrial accident, pinned under heavy equipment

## Signs and Symptoms

- Hypotension / Shock
- Altered mental status
- **Compartment Syndrome:**
  - Pain
  - Paresthesia
  - Paralysis
  - Pallor
  - Pulselessness
  - Poikilothermia (cool to touch)

## Differential

- Entrapment without crush syndrome
- Vascular injury with perfusion deficit
- Compartment syndrome
- Altered mental status

## EMR & EMT-Basic

1. Ensure scene and rescuer safety.
2. **INITIAL TRAUMA CARE.**
3. Place approved tourniquet on the affected extremity (-ies) just proximal, but as close as possible to the crushed area.
4. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT.**
2. Establish 2 large bore IVs (not in the injured extremity).
3. Treat pain based on PAIN MANAGEMENT Protocol.
4. Administer **NORMAL SALINE 20 mL/kg** bolus prior to release of crushed extremity. Continue **NORMAL SALINE 10 mL/kg/hr.**
5. Call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **ILS TREATMENT.**
2. Initiate cardiac monitoring and assess for hyperkalemia (Wide QRS, Peaked T waved or flattened / absent P waves). Acquire and transmit 12-lead ECG.
3. Administer **SODIUM BICARBONATE 1 mEq/kg** (max 50 mEq) for significant crush injuries or prolonged entrapment of an extremity. Mix Sodium Bicarbonate in Normal Saline 20 mL/kg fluid bolus and administer PRIOR to release of crushed extremity.
4. Lift object **SLOWLY** off of the patient.
5. Continue **NORMAL SALINE 10 mL/kg/hr.**
6. Transport to appropriate Trauma Facility.

# Crush Injuries

## PEARLS

- A patient with a crush injury may initially present with very few signs and symptoms. Therefore, maintain a high index of suspicion for any patient with a compressive mechanism of injury.
- A fatal medical complication of crush syndrome is hyperkalemia. Suspect hyperkalemia if T-waves become peaked, QRS becomes prolonged (greater than 0.12 seconds), absent P wave, or prolonged QTc.
- Avoid Lactated Ringer's solution as it contains potassium.
- Continue fluid resuscitation through extrication and transfer to hospital.
- Patient may become hypothermic even in warm environments.

## KEY DOCUMENTATION ELEMENTS

- Time of tourniquet application, if applied
- Neurovascular status of any crushed extremity
- ECG findings consistent with hyperkalemia
- Amount of IV fluid administered

## PERTINENT ASSESSMENT FINDINGS

- Monitor for development of compartment syndrome
- Mental status / GCS
- Evidence of additional trauma, potentially masked by other painful injuries

## QUALITY METRICS

- Initiation of fluid resuscitation prior to extrication
- ECG / monitor to monitor for dysrhythmias or changes related to hyperkalemia
- Appropriate transport of trauma patients to Trauma Center
- Documentation of estimated weight in kilograms



# Extremity Trauma / External Hemorrhage Management

## History

- Type of injury
- Mechanism: Crush / Penetrating / Amputation
- Time of injury
- Open vs. closed wound / Fracture
- Wound contamination
- Medical History (Tetanus history)
- Medications

## Signs and Symptoms

- Pain, swelling
- Deformity
- Altered sensation / Motor function
- Diminished pulse / Capillary refill
- Decreased extremity temperature

## Differential

- Abrasion
- Contusion
- Laceration
- Sprain
- Dislocation
- Fracture
- Amputation

## All Levels

1. **INITIAL TRAUMA CARE.**
2. Manage bleeding.
  - a. Apply direct pressure to bleeding site followed by pressure dressing.
  - b. If direct pressure / pressure dressing is ineffective or impractical:
    - i. Apply TOURNIQUET to extremity if the bleeding site is amenable to tourniquet placement.
      1. Tourniquet should be placed 2-3 inches proximal to wound, not over a joint or fracture, and tightened until bleeding stops and distal pulse is eliminated.
      2. If bleeding continues, place a second tourniquet proximal to the first.
      3. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially to eliminate distal pulse.
      4. Document time of application and location of tourniquet and ensure that receiving facility is aware of time of placement.
    - ii. If the bleeding site is not amenable to tourniquet placement (i.e. trunk, head, etc.), pack wound tightly with HEMOSTATIC GAUZE and apply direct pressure.
3. Manage pain.
  - a. Refer to PAIN MANAGEMENT Protocol.
  - b. Pain management should be strongly considered for patients with suspected fractures.
  - c. If tourniquet is placed, an alert patient will likely require pain medication to manage pain.
4. Stabilize suspected fractures / dislocations.
  - a. Strongly consider pain management before attempting to move a suspected fracture.
  - b. If distal vascular function is compromised, gently attempt to restore normal anatomic position.
  - c. Use splints as appropriate to limit movement of suspected fracture.
  - d. Elevate extremity fractures above heart level whenever possible to limit swelling.
  - e. Apply ice packs to limit swelling in suspected fractures or soft tissue injury (DO NOT apply ice directly to skin).
  - f. Reassess distal neurovascular status after any manipulation or splinting of fractures / dislocations.
5. Amputations
  - a. Rinse amputated part gently with normal saline if grossly contaminated.
  - b. Wrap part in moist sterile gauze and place in water tight plastic bag and seal.
  - c. Place sealed bag on ice. **(DO NOT place tissue directly on ice).**

# Extremity Trauma / External Hemorrhage Management

## PEARLS

- If tourniquet use:
  - a. Ensure that it is sufficiently tight to occlude the distal pulse, in order to avoid compartment syndrome.
  - b. Ensure that it is well marked and visible and that all subsequent providers are aware of the presence of the tourniquet.
  - c. DO NOT cover with clothing or dressings.
  - d. Mark time of tourniquet placement prominently on the patient.
- If pressure dressing or tourniquet used, frequently re-check to determine if bleeding has restarted. Check for blood soaking through the dressing or continued bleeding distal to the tourniquet. Do not remove tourniquet or dressing in order to assess bleeding.
- Survival is markedly improved when a tourniquet is placed *before* shock ensues.
- Commercial / properly tested tourniquets are preferred over improvised tourniquets.
- If hemostatic gauze is not available, plain gauze packed into a wound has been shown to be effective.
- DO NOT take time to splint injured extremities in major trauma patients unless it does not delay the scene time or if it prevents you from performing more pertinent patient care.
- Splint the joint above and below for all suspected fractures.
- Splint the bone above and below for all suspected joint injuries.
- Hip dislocations and knee and elbow fracture / dislocations have a high incidence of vascular compromise.
- Urgently transport any injury with vascular compromise.
- DO NOT manipulate pelvis once fracture is suspected. Repeated manipulation can increase internal hemorrhage.

## KEY DOCUMENTATION ELEMENTS

- Vital signs and vascular status of extremity after placement of tourniquet, pressure dressing, or splint
- Documentation of elimination of distal pulse after tourniquet placement
- Time of tourniquet placement

## PERTINENT ASSESSMENT FINDINGS

- Evaluate for obvious deformity, shortening, rotation, or instability
- Neurologic status of extremity
  - a. Sensation to light touch
  - b. Distal movement of extremity
- Vascular status of extremity
  - a. Pallor
  - b. Pulse
  - c. Capillary refill
  - d. Degree of bleeding / blood loss with assessment of the color of the blood (venous or arterial) and whether it is pulsatile or not

## QUALITY METRICS

- Proper placement of tourniquet (location, elimination of distal pulse)
- Proper marking and timing of tourniquet placement and notification of subsequent providers of tourniquet placement
- Appropriate splinting of fractures
- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center

# Head Injury

## History

- Time of injury
- Mechanism (blunt vs penetrating)
- Loss of consciousness
- Bleeding
- Past medical history
- Medications
- Evidence for multi-trauma
- Helmet use or damage to helmet

## Signs and Symptoms

- Pain, swelling, bleeding
- Altered mental status
- Unconscious
- Respiratory distress / failure
- Vomiting
- Major traumatic mechanism of injury
- Seizure

## Differential

- Skull fracture
- Brain injury (Concussion, Contusion, Hemorrhage or Laceration)
- Epidural hematoma
- Subdural hematoma
- Subarachnoid hemorrhage
- Spinal injury
- Abuse

## EMR & EMT-Basic

1. **INITIAL TRAUMA CARE.**
2. Maintain cervical stabilization per the SPINAL MOTION RESTRICTION Protocol.
3. Airway:
  - a. If patient unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury or possible basilar skull fracture).
4. Breathing:
  - a. Administer 100% **Oxygen** as appropriate with a target of achieving 94-98% saturation.
5. Circulation:
  - a. Wound care
    - i. Control bleeding with direct pressure if no suspected open skull injury.
    - ii. Moist sterile dressing to any potential open skull wound.
6. Disability:
  - a. Evaluate for other causes of altered mental status—check blood glucose.
  - b. Spinal assessment and management per SPINAL MOTION RESTRICTION Protocol.
  - c. Perform and trend neurologic status assessment (moderate / severe: GCS 3-13, P or U on AVPU)
    - i. Early signs of deterioration: Confusion, Agitation, Drowsiness, Vomiting, Severe Headache.
    - ii. Monitor for signs of herniation.
7. Treat specific facial injuries as indicated:
  - a. **Unstable Mandible:** Have suction readily available as patient may not be able to spit / swallow effectively. Preferably transport patient sitting upright if no suspected spinal injury.
  - b. **Eye Trauma:** Place eye shield for any significant eye trauma (if available). If globe is avulsed, cover with moist saline dressing.
  - c. **Avulsed Tooth:** Avoid touching the root of the avulsed tooth. Do not wipe off tooth. Pick up at crown end and rinse off with cold water, if dirty. Place in milk or saline as the storage medium.
  - d. **Epistaxis:** Squeeze nose for 10-15 minutes continuously.
8. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

Protocol Continues

# Head Injury

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. For patients with moderate / severe head injury:
  - a. If unable to maintain their airway, use continuous waveform capnography and EtCO<sub>2</sub> measurement if available, with a target EtCO<sub>2</sub> of 35-40 mmHg.
  - b. Administer **IV Fluid 20 mL/kg** to maintain age appropriate SBP. May repeat x2 as needed to maintain age appropriate SBP. Hypotension should be avoided to maintain cerebral perfusion.
3. For patients with a severe head injury with signs of herniation that are unconscious or semi-conscious:
  - a. Manage airway according to the AIRWAY MANAGEMENT Protocol; hyperventilate to a target EtCO<sub>2</sub> of 30-35 mmHg as a short-term option.

PEDIATRIC GLASGOW COMA SCALE (GCS)		
Behavior	Response	Score
Eye Opening	Spontaneous	4
	To Sound	3
	To Pressure / Pain	2
	None	1
Verbal Response	Oriented (Smiles, oriented to sounds, follows objects, interacts)	5
	Confused (Cries but consolable, inappropriate interactions)	4
	Words (Inconsistently consolable, moaning)	3
	Sounds (Inconsolable, agitated)	2
	None (No vocalization)	1
Best Motor Response	Obeys Commands (normal spontaneous movements)	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion to Pain (decorticate)	3
	Extension to Pain (decerebrate)	2
	None	1

# Head Injury

## PEARLS

- Head injury severity guideline:
  - a. Mild: GCS 13-15 / AVPU = (A)
  - b. Moderate: GCS 9-12 / AVPU = (V)
  - c. Severe: GCS 3-8 / AVPU = (P) or (U)
- The most important item to monitor and document is a change in the level of consciousness.
- If endotracheal intubation or invasive airways are used, continuous waveform capnography is required to document proper tube placement and assure proper ventilation rate.
- Signs of herniation
  - a. Decreasing mental status
  - b. Abnormal respiratory pattern
  - c. Asymmetric / unreactive pupils
  - d. Decorticate posturing
  - e. Cushing's response (bradycardia and hypertension)
  - f. Decerebrate posturing
- DO NOT hyperventilate patient unless signs of herniation are present.
- Assume concomitant cervical spine injury in patients with moderate / severe head injury.

## KEY DOCUMENTATION ELEMENTS

- Adequate oxygenation
- Airway status and management
- EtCO<sub>2</sub> monitored and documented for moderate / severe head injury (avoidance of inappropriate hyperventilation)
- Neurological and mental status assessment

## PERTINENT ASSESSMENT FINDINGS

- Neurologic status assessment findings
- Pupils
- Trauma findings on physical exam

## QUALITY METRICS

- Scene time for trauma patients
- Appropriate transport of trauma patients to Trauma Center
- Documentation of estimated weight in kilograms

# Head Injury

Intentionally Left  
Blank

# Spinal Motion Restriction

**Spinal Motion Restriction** is defined as application of a cervical collar and maintenance of the spine in neutral alignment (long backboard, a scoop stretcher, a vacuum mattress, or an ambulance cot).

Determination of spinal motion restriction should be made by the highest level EMS provider.

## All Levels

- Spinal Motion Restriction** is required when ANY of the following conditions apply following blunt trauma: (*When in doubt; apply spinal motion restriction*).
  - Acutely altered level of consciousness** (e.g., GCS <15, evidence of intoxication, also for pediatric patients agitation, apnea, hypopnea, somnolence)
  - Midline neck or back pain and/or tenderness.**
  - Focal neurologic signs** and/or symptoms (e.g., numbness or motor weakness).
  - Anatomic deformity of the spine.**
  - Distracting circumstances or injury** (e.g., long bone fracture, degloving, or crush injuries, large burns, etc.) or any similar injury that impairs the patient's ability to contribute to a reliable examination.
  - Torticollis** (patient is unable to move neck from "abnormal position" to "normal position").
  - Communication barrier** (emotional / language / cognitive impairment).
- Spinal Motion Restriction is NOT utilized in penetrating trauma to the head and/or neck without evidence of spinal injury.
- Patient's should be allowed to self extricate, if able, from a vehicle after placing a cervical collar, if indicated.
- Once the backboarded patient is placed on ambulance cot, remove backboard by using a log roll technique, minimizing unnecessary movement during the removal process. Maintain Spinal Motion Restriction by assuring that the patient remains securely positioned on the cot with a cervical collar in place.
- Helmet removal:
  - If a football helmet needs to be removed, it is recommended to remove the face mask followed by manual removal (rather than the use of automated devices) of the helmet while keeping the neck manually immobilized - occipital and shoulder padding should be applied, as needed, with the patient in a supine position, in order to maintain neutral cervical spine positioning.

Peter E. Fischer, Debra G. Perina, Theodore R. Delbridge, Mary E. Fallat, Jeffrey P. Salomone, Jimm Dodd, Eileen M. Bulger & Mark L. Gestring (2018): Spinal Motion Restriction in the Trauma Patient – A Joint Position Statement, Prehospital Emergency Care, DOI: 10.1080/10903127.2018.1481476

# Spinal Motion Restriction

## PEARLS

- Be aware of potential airway compromise or aspiration in immobilized patient with nausea / vomiting, or with facial / oral bleeding.
- Excessively tight immobilization straps can limit chest excursion and cause hypoventilation.
- Prolonged immobilization on spine board can lead to ischemic pressure injuries to skin.
- Prolonged immobilization on spine board can be very uncomfortable for patient.
- Children are abdominal breathers, so immobilization straps should go across chest and pelvis and not across the abdomen, when possible.
- Children have disproportionately larger heads. When securing pediatric patients to a spine board, the board should have a recess for the head, or the body should be elevated approximately 1-2 cm to accommodate the larger head size and avoid neck flexion when immobilized.
- In an uncooperative patient, avoid interventions that may promote increased spinal movement.
- The preferred position for all patients with spine management is flat and supine. There are three circumstances under which raising the head of the bed to 30 degrees should be considered:
  - a. Respiratory distress
  - b. Suspected severe head trauma
  - c. Promotion of patient compliance
- Age alone should not be a factor in decision-making for prehospital spine care, yet the patient's ability to reliably be assessed at the extremes of age should be considered. Communication barriers with infants / toddlers or elderly patients with dementia may prevent the provider from accurately assessing the patient.
- Spinal precautions should be considered a treatment or preventive therapy.
- Patients who are likely to benefit from immobilization should undergo this treatment.
- Patients who are not likely to benefit from immobilization, who have a low likelihood of spinal injury, should not be immobilized.
- Ambulatory patients may be safely immobilized on cot with cervical collar and straps and will not generally require a spine board.
- Reserve long spine board use for the movement of patients whose injuries limit ambulation and who meet criteria for the use of spinal precautions. Remove from the long board as soon as is practical.

## KEY DOCUMENTATION ELEMENTS

- Patient complaint of neck or spine pain
- Spinal tenderness
- Mental status / GCS
- Neurologic examination
- Evidence of intoxication
- Documentation of multiple trauma
- Documentation of mechanism of injury

## PERTINENT ASSESSMENT FINDINGS

- Mental status
- Neurologic examination
- Evidence of intoxication
- Evident of multiple trauma with distracting injuries

## QUALITY METRICS

- Percentage of patients with high risk mechanisms of injury and/or signs or symptoms of cervical spine injury who are placed in a cervical collar
- Percentage of trauma patients who are transported on a long backboard



# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

## History

- Substance
- Time of ingestion or exposure
- Route of exposure
- Quantity of medication or toxin taken
- Alcohol or other intoxicant taken
- Past medical history
- Medications
- Decontamination performed
- Treatment prior to arrival

## Signs and Symptoms

### SLUDGE<sup>M</sup>

- Salivation
- Lacrimation
- Urination; increase, loss of control
- Defecation / Diarrhea
- GI Upset; Abdominal pain)
- Emesis
- Muscle Twitching / Miosis

### Killer B's

- Bradycardia, Bronchorrhea, Bronchospasm
- CNS (headache, confusion, seizures, lethargy or unresponsive)

## Differential

- Nerve agent exposure (e.g. VX, Sarin, Soman, etc.)
- Organophosphate exposure (pesticide)
- Vesicant exposure (e.g. Mustard Gas, etc.)
- Respiratory irritant exposure (e.g. Hydrogen Sulfide, Ammonia, Chlorine, etc.)

## Estimated Level of Exposure

	Signs & Symptoms
<b>Mild</b>	Shortness of Breath; Wheezing; Runny Nose
<b>Moderate</b>	Vomiting; Drooling; Pinpoint Pupils
<b>Severe</b>	Unconsciousness; Cyanosis; Seizures

\*per Illinois EMSC Protocols

## EMR & EMT-Basic

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Save all bottles, containers or labels for information.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access. Consider **NORMAL SALINE 20 ml/kg** fluid bolus to maintain age appropriate SBP. May repeat fluid bolus as needed to maintain age appropriate SBP.
3. If symptomatic, administer **ATROPINE** per dosing chart on next page.
4. Repeat **ATROPINE** every 5-10 minutes until symptoms of SLUDGE subside, most importantly secretions.
5. If seizures occur, refer to SEIZURE protocol.

# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

## Atropine Dosage Chart

	ATROPINE DOSE	
	MILD / MODERATE (0.05 mg/kg IM)	SEVERE (0.1 mg/kg IM)
<b>Infant</b>	0.25 mg IM	0.5 mg IM
<b>Infant</b> 7 mo - 2 yrs (7-13 kg)	0.5 mg IM	1 mg IM
<b>Child</b> 3-7 yrs (14-25 kg)	1 mg IM	2 mg IM
<b>Child</b> 8-14 yrs (26-50 kg)	2 mg IM	4 mg IM
<b>Adolescent</b> > 14 yrs (> 51 kg)	2 mg IM	4 mg IM

# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

## PEARLS

- Continuous and ongoing patient reassessment is critical.
- Clinical response to treatment is demonstrated by the drying of secretion and the easing of respiratory effort.
- Initiation of and ongoing treatment should not be based upon heart rate or pupillary response.
- Atropine is the primary antidote for organophosphate, carbamate, or nerve agent exposures, and repeated doses should be administered liberally to patients who exhibit signs and symptoms of exposure or toxicity.
- Clinical effects of acetylcholinesterase inhibitor agents
  - a. The clinical effects are caused by the inhibition of the enzyme acetylcholinesterase which allows excess acetylcholine to accumulate in the nervous system.
  - b. The excess accumulated acetylcholine causes hyperactivity in muscles, glands, and nerves.
- Organophosphates (certain Insecticides)
  - a. Can be legally purchased by the general public.
  - b. Organophosphates (e.g. pesticides) penetrate tissues and bind to the patient's body fat producing a prolonged period of illness and ongoing toxicity even during aggressive treatment.
- Nerve agents
  - a. Traditionally classified as weapons of mass destruction (WMD).
  - b. Not readily accessible to the general public.
  - c. Extremely toxic and rapidly fatal with any route of exposure.
  - d. GA (tabun), GB (sarin), GD (soman), GF, and VX are types of nerve agents and are WMDs.
  - e. Nerve agents can persist in the environment and remain chemically toxic for a prolonged period of time.

## KEY DOCUMENTATION ELEMENTS

- Time to recognize initial signs and symptoms
- Number of repeated doses of atropine required for the secretions diminish and respirations to improve
- Patient reassessments
- Patient responses to therapeutic interventions
- Measures taken to decontaminate the patient
- Measures taken to protect clean environments from contamination

## PERTINENT ASSESSMENT FINDINGS

- Signs and symptoms exhibited with the toxidromes of **SLUDGE** and **Killer B's**

## QUALITY METRICS

- Recognition and appropriate treatment of patients
- Documentation of estimated weight in kilograms

# Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

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# Altitude Illness

## History

- Past medical history
- Prior history of altitude illness
- Patient's itinerary
  - Starting altitude
  - Highest altitude gained
  - Rate of ascent
- Presence of prophylaxis against altitude (i.e. acetazolamide, sildenafil)
- Total altitude descended

## Signs and Symptoms

- (See definitions below)

## Differential

- Carbon monoxide poisoning
- Hypo-/hyperthermia
- Stroke
- Drugs / Alcohol
- Hypoglycemia
- Trauma
- Exhaustion

## Definitions

- **Acute mountain sickness:** Headache plus one or more of the following: anorexia, nausea or vomiting, fatigue or weakness, dizziness or lightheadedness or difficulty sleeping. These symptoms must occur in the setting of recent arrival to high altitude (generally considered greater than 5000 – 7000 feet).
- **High altitude pulmonary edema (HAPE):** Progressive dyspnea, cough, hypoxia, and weakness in high altitude environments (considered greater than 8000 feet). Patients may or may not exhibit symptoms if acute mountain sickness precedes symptoms of HAPE .
- **High altitude cerebral edema (HACE):** Heralded by mental status changes in patients with symptoms of acute mountain sickness including altered mentation, ataxia, or stupor and progressing to coma. Typically seen in high altitude environments (greater than 8000 feet).

## All Levels

1. Ensure scene and rescuer safety.
2. **UNIVERSAL PATIENT CARE.**
3. Perform ABCs and manage airway as necessary.
4. Administer supplemental oxygen to keep oxygen saturations  $\geq 90\%$ .
5. Descend to lower altitude. Descent is the mainstay of therapy and is the definitive therapy for all altitude related illnesses.
  - a. Descent should be initiated as soon as scene conditions permit.

# Altitude Illness

## PEARLS

- Patients suffering from altitude illness have exposed themselves to a dangerous environment. By entering the same environment, providers are exposing themselves to the same altitude exposure. Be vigilant in looking for symptoms of altitude illness amongst rescuers.
- Descent of 500-1000 feet is often enough to see improvements in patient conditions.
- Patients with HAPE are suffering from non-cardiogenic pulmonary edema and may benefit from positive pressure ventilation via either bag assisted ventilation, CPAP, or other means of positive pressure ventilation.
- Patients suffering from altitude illness are commonly dehydrated and require IV fluids.
- HAPE is the most lethal of all altitude illnesses.
- Consider alternate causes of symptoms of AMS - the symptoms of AMS may be caused by alternate etiologies such as carbon monoxide poisoning (in patients cooking within enclosed areas), dehydration, exhaustion, hypoglycemia, hyponatremia.

## KEY DOCUMENTATION ELEMENTS

- Patient's itinerary, including starting altitude, highest altitude gained and rate of ascent
- Presence (or absence) of prophylaxis against altitude (including medications such as acetazolamide, sildenafil)
- Total altitude descended

## PERTINENT ASSESSMENT FINDINGS

- Consider airway management needs in the patient with severe alteration in mental status
- HAPE will present with increasing respiratory distress and rales on exam
- HACE will present with mental status changes, ataxia and progressing to coma

## QUALITY METRICS

# Bites and Envenomation

## History

- Type of bite / sting
- Description of creature or bring photo with patient for identification
- Time, location, size of bite / sting
- Previous reaction to bite / sting
- Domestic vs. Wild
- Tetanus and Rabies risk
- Immunocompromised patient

## Signs and Symptoms

- Rash, skin break, wound
- Pain, soft tissue swelling, redness
- Blood oozing from the bite wound
- Evidence of infection
- Shortness of breath, wheezing
- Allergic reaction, hives, itching
- Hypotension or shock

## Differential

- Animal bite
- Human bite
- Snake bite (poisonous)
- Spider bite (poisonous)
- Insect sting / bite (bee, wasp, ant, tick)
- Infection risk
- Rabies risk
- Tetanus risk

## EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. If signs of allergic reaction refer to ALLERGIC REACTION / ANAPHYLAXIS Protocol.
3. For Insect Bite:
  - a. Remove stinger if appropriate.
  - b. Remove constricting items.
  - c. Apply ice pack.
  - d. Minimize movement.
4. For Snake Bite:
  - a. Splint limb, bandage and place at level below the heart.
  - b. Minimize movement.
  - c. Remove constricting items.
  - d. Do **NOT** apply ice.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access, as needed.
3. Consider management of pain per the PAIN MANAGEMENT Protocol.

# Bites and Envenomation

## PEARLS

- **Evidence of infection:** Swelling, redness, drainage, fever, red streaks proximal to wound.
- Immunocompromised patients are at an increased risk for infection: Diabetes, chemotherapy, transplant patients.
- Patient may still have an imbedded stinger, tooth, nematocyst, or barb which may continue to deliver toxin if left imbedded. Consider safe removal without squeezing the toxin delivery apparatus.
- **Human bites:** Human bites have higher infection rates than animal bites due to normal mouth bacteria.
- **Dog / Cat / Carnivore bites:** Carnivore bites are much more likely to become infected and all have risk of Rabies exposure. Cat bites may progress to infection rapidly due to a specific bacteria (*Pasteurella multocida*).
- **Snake bites:** Coral snake bites are rare: very little pain but very toxic. "Red on yellow - kill a fellow, red on black - venom lack." Amount of envenomation is variable, generally worse with larger snakes and early in spring.
- **Spider bites:** Black Widow spider bites tend to be minimally painful, but over a few hours, muscular pain and severe abdominal pain may develop (spider is black with red hourglass on belly). Brown Recluse spider bites are minimally painful to painless. Little reaction is noted initially but tissue necrosis at the site of the bite develops over the next few days (brown spider with fiddle shape on back).

## KEY DOCUMENTATION ELEMENTS

- Describe the suspect bite or sting source without risking patient or EMS provider
- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Time of symptoms onset
- Therapy and response to therapy

## PERTINENT ASSESSMENT FINDINGS

- Assess for signs and symptoms of local and systematic impact of the suspected toxin
- Patient may still have an imbedded stinger, tooth, nematocysts or barb which may continue to deliver toxin if left imbedded

## QUALITY METRICS

- Offending organism was managed appropriately without secondary exposure
- Appropriate pain management



# Carbon Monoxide / Smoke Inhalation

## History

- Exposure to Carbon Monoxide
- Time / Duration of exposure
- Smoke inhalation
- Reason: Suicide, criminal, accidental
- Past medical history

## Signs and Symptoms

- Facial burns
- Singed nasal hairs or facial hair
- Shortness of breath
- Facial edema
- Stridor

### Carbon Monoxide

- Mild: Nausea, Fatigue, Headache, Vertigo, Lightheadedness
- Moderate to severe: AMS, Tachypnea, Tachycardia, Convulsion, Cardiopulmonary arrest

## Differential

- Diabetes
- Cardiac (ACS / MI)
- Infection
- Anaphylaxis
- Head injury / Trauma
- Co-ingestant or exposure

## EMR & EMT-Basic

1. Assure scene is safe.
2. **UNIVERSAL PATIENT CARE.**
  - a. Check blood glucose level.
  - b. Apply **100% OXYGEN** via **NRB**
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access, as needed.
3. Consider the need for early advanced airway if signs of inhalation injury are present. Refer to the AIRWAY MANAGEMENT Protocol.
4. Consider cyanide toxicity in smoke inhalation patients. Refer to the CYANIDE POISONING Protocol.
5. Continue to monitor the patient.

# Carbon Monoxide / Smoke Inhalation

## PEARLS

- Remove patient and response personnel from potentially hazardous environment as soon as possible.
- Provide instruction to the patient, the patient's family, and other appropriate bystanders to not enter the environment (e.g. building, car) where the carbon monoxide exposure occurred until the source of the poisoning has been eliminated.
- CO oximeter devices may yield inaccurate low / normal results for patients with CO poisoning. All patients with probable or suspected CO poisoning should be transported to the nearest appropriate hospital based on their presenting signs and symptoms.
- Pulse oximetry is inaccurate due to the carbon monoxide binding with hemoglobin.
- Consider cyanide toxicity if carbon monoxide poisoning is from a fire
- Smoke is a dangerous mixture of toxic gases and suspended chemical resulting from combustion. Smoke inhalation is the result of inhaling these heated component. While it may be impossible to predict exactly what components of combustion are inhaled, cyanide (CN) and carbon monoxide (CO) are common elements found in smoke and should be suspected in all smoke inhalation victims.

## KEY DOCUMENTATION ELEMENTS

- If using a carbon monoxide detector, record the level detected
- Evidence of soot or burns around the face, nares or pharynx
- Early and repeat assessment of respiratory status and neuro exam
- Accurate exposure history

## PERTINENT ASSESSMENT FINDINGS

- Early and repeat assessment of patient's mental status and motor function are extremely useful in determining response to therapy and the need for hyperbaric therapy
- Identification of possible etiology of poisoning
- Time of symptom onset and time of initiation of exposure-specific treatment
- Response to therapy

## QUALITY METRICS

- Appropriate protocol selection and management
- Multiple frequent documented reassessments
- Early airway management in the rapidly deteriorating patient

# Cyanide Poisoning

## History

- Exposure to Cyanide (inhalation, ingestion or absorption through skin)
- Time / Duration of exposure
- Smoke inhalation
- Industrial exposure
- Reason: Suicide, criminal, accidental
- Past medical history

## Signs and Symptoms

- CNS (Headache, Anxiety, Weakness, Vertigo)
- Tachycardia / Tachypnea
- Nausea / Vomiting
- Flushed "cherry red" skin

### SEVERE:

- Marked Altered LOC
- Seizures
- Respiratory depression or respiratory arrest
- Cardiac dysrhythmias

## Differential

- Diabetes
- Cardiac (ACS / MI)
- Infection
- Anaphylaxis
- Head injury / trauma
- Co-ingestant or exposure

## Note

**This protocol assumes a Cyanokit is available.**

## EMR, EMT-Basic & EMT-Intermediate

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## Paramedic

1. Continue **EMR / BLS / ILS TREATMENT**.
2. Establish IV access.



## Medical Control



3. Consider **HYDROXOCOBALAMIN (Cyanokit) 70 mg/kg IV (max 5 grams)**.
  - a. Reconstitute: Place the vial of hydroxocobalamin in an upright position; add 200 mL of 0.9% NaCl to the using the transfer spike. Fill to the line.
  - b. Mix: The vial should be repeatedly inverted or rocked, NOT shaken, for at least 60 seconds prior to infusion.
  - c. Infuse Vial: Use vented IV tubing, hang and infuse over 15 minutes.

# Cyanide Poisoning

## PEARLS

- Scene safety is priority!
- Cyanide is a colorless, “bitter almond smell” (genetically only 40% of population can smell) gas or white crystal which binds to the ferric ion in cells, blocking the enzyme cytochrome oxidase, thus preventing the use of oxygen by the cell’s mitochondria, leading to cellular hypoxia.
- There is no widely available, rapid, confirmatory cyanide blood test. Many hospitals will not be able to rapidly assess cyanide levels. Therefore, treatment decisions must be made on the basis of clinical history and signs and symptoms of cyanide intoxication.
- Pulse oximetry accurately reflects serum levels of oxygen but does not accurately reflect tissue oxygen levels therefore should not be relied upon in possible cyanide and/or carbon monoxide toxicity.
- After hydroxocobalamin has been administered, pulse oximetry levels are no longer accurate.
- If the patient ingests cyanide, it will react with the acids in the stomach generating hydrogen cyanide gas. Be sure to maximize air circulation in closed spaces (ambulance) as the patient’s gastric contents may contain hydrogen cyanide gases when released with vomiting or belching.
- If smoke inhalation, always consider carbon monoxide poisoning.
- Smoke is a dangerous mixture of toxic gases and suspended chemical resulting from combustion. Smoke inhalation is the result of inhaling these heated component. While it may be impossible to predict exactly what components of combustion are inhaled, cyanide (CN) and carbon monoxide (CO) are common elements found in smoke and should be suspected in all smoke inhalation victims.

## KEY DOCUMENTATION ELEMENTS

- Repeat evaluation and documentation of signs and symptoms as the patient’s clinical condition may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptoms onset
- Time of treatment
- Therapy and response to therapy

## PERTINENT ASSESSMENT FINDINGS

- Early and repeated assessment is essential

## QUALITY METRICS

- Appropriate protocol selection and management
- Multiple frequent documented reassessments
- Early airway management in the rapidly deteriorating patient
- Documentation of estimated weight in kilograms

# Drowning / Submersion Injury

## History

- Circumstances leading to the submersion
- Submersion in water regardless of depth
- Duration of submersion / immersion
- Temperature of water (possibility of hypothermia)
- Details of mechanism of injury (c-spine injury?)

## Signs and Symptoms

- Unresponsive
- Mental status changes
- Decreased or absent vital signs
- Foaming / Vomiting
- Coughing, Wheezing, Rales, Rhonchi, Stridor
- Apnea

## Differential

- Trauma
- Pre-existing medical problem
  - Hypoglycemia
  - Cardiac Dysrhythmias
- Pressure injury (diving)
  - Barotrauma
  - Decompression sickness

## EMR & EMT-Basic

1. Approach scene with due caution for rescuer safety.
2. Remove patient from water with spinal motion restriction precautions. Refer to SPINAL MOTION RESTRICTION Protocol.
3. **UNIVERSAL PATIENT CARE.**
4. Apply **OXYGEN** as needed with a target oxygen saturation of 94-98%.
5. If patient becomes pulseless and apneic begin CPR and refer to CARDIAC ARREST Protocol.
6. If patient presents with hypothermia, refer to ENVIRONMENTAL HYPOTHERMIA Protocol.
7. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Advanced airway management as indicated. Refer to AIRWAY MANAGEMENT Protocol.

# Drowning / Submersion Injury

## PEARLS

- **Pediatric Considerations:**
  - a. Drowning is a common cause of death in children.
  - b. Risk factors for drowning include male gender, age less than 14 yo, alcohol use, lack of supervision, and risky behavior.
- The World Health Organization definition of drowning is “the process of experiencing respiratory impairment from submersion / immersion in liquid”.
- Drowning is further defined in the following categories:
  - a. Non-fatal drowning – patients rescued from drowning.
  - b. Fatal drowning – any death, acutely or subacutely, resultant from drowning.
- Submersion refers to situations in which the patient’s airway is underwater. Immersion refers to situations in which the patient’s body is in water but the patient’s airway remains out of the water.
- Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water.
- Initiation of in-water ventilations may increase survival – In-water chest compressions are futile.
- Long-standing teaching has suggested that rescuers should always assume c-spine injury in victims of drowning.
  - a. The 2010 American Heart Association update on special circumstances in cardiac arrest notes that routine c-spine precautions in all victims of drowning is likely unnecessary unless the mechanism or injury, history, or physical exam suggests a cervical spine injury.
  - b. Mechanisms of injury highly suggestive of cervical spine injury include diving, water skiing, surfing or watercraft accidents.
- Patients may develop subacute respiratory difficulty after drowning and therefore all victims of drowning should be transported for observation.
- Hypothermia is often associated with drowning and submersion injuries even with warm ambient conditions.

## KEY DOCUMENTATION ELEMENTS

- Mechanism of injury or history suggesting cervical spine injury
- Submersion time
- Water temperature
- Activities leading to drowning

## PERTINENT ASSESSMENT FINDINGS

- Cardiac arrest in drowning is caused by hypoxia, airway and ventilation are equally important to CPR
- Assess for other associated injuries such as injuries to the head / neck or dive-related emergencies.

## QUALITY METRICS

- Recognition and appropriate care of pulmonary / respiratory complaints
- Cervical spine management when appropriate

# Environmental Hyperthermia

## History

- Age
- Oral intake
- Past medical history / Medications
- Ambient temperature and humidity
- Exertion level
- Duration of exposure
- Fatigue and/or muscle cramping
- Attire (clothing worn)
- Confined space (i.e. child left in car)

## Signs and Symptoms

- Altered mental status / Coma
- Hot, dry or sweaty skin
- Hypotension or shock
- Seizures
- Nausea / Vomiting
- Headache
- Cramps

## Differential

- Fever (Infection)
- Dehydration
- Medication induced (neuroleptic malignant syndrome, malignant hyperthermia)
- Hyperthyroidism (Thyroid Storm)
- Delirium Tremens (DT's)
- Heat cramps, exhaustion, stroke
- CNS lesions or tumors

## Definitions

**Heat Cramps:** are minor muscle cramps usually in the legs and abdominal wall. Patient temperature is normal.

**Heat Exhaustion:** has both salt and water depletion usually of a gradual onset. As it progresses tachycardia, hypotension, elevated temperature, and very painful cramps occur. Symptoms of headache, nausea and vomiting occur. Heat exhaustion can progress to heat stroke. Skin usually cool and moist.

**Heat Stroke:** occurs when the cooling mechanism of the body (sweating) ceases due to temperature overload and/or electrolyte imbalances. Patient temperature is usually *greater than* 104°F. When no thermometer is available, it is distinguished from heat exhaustion by altered level of consciousness. Skin usually hot and dry.

## Heat Cramps

### EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Remove patient to a cool environment.
3. If nausea and vomiting not present, have patient drink oral fluids, preferably electrolyte solutions.
4. **DO NOT** massage cramping muscles.
5. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. If no response to electrolyte solution or none is available, establish IV access and administer **NORMAL SALINE 20 mL/kg** and reassess patient.
3. If patient remains symptomatic, repeat fluid bolus as long as lungs remain clear; maximum **60 mL/kg**.

Protocol Continues 

# Environmental Hyperthermia

## **Heat Exhaustion / Stroke**

### **EMR & EMT-Basic**

1. **UNIVERSAL PATIENT CARE.**
2. Remove patient to a cool environment.
3. Manage airway as needed per the AIRWAY MANAGEMENT Protocol.
4. Check blood glucose level. If glucose < 60 mg/dL refer to DIABETIC EMERGENCIES Protocol.
5. Initiate active cooling:
  - a. Remove patient's clothing; protect privacy.
  - b. Cool patient with water and fans.
  - c. Apply cold packs to neck, groin and armpits.
  - d. Cover patient with cool, wet sheets and fan.
  - e. DO NOT induce shivering. Stop cooling if shivering occurs.
6. Avoid fluids by mouth, especially if patient is nauseated.
7. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### **EMT-Intermediate & Paramedic**

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **NORMAL SALINE 20 mL /kg** fluid bolus and reassess patient.
4. If patient remains symptomatic, repeat fluid bolus as long as lungs remain clear to a maximum of 60 mL/kg.
5. Be prepared to treat seizures per SEIZURE Protocol



# Environmental Hyperthermia

## PEARLS

- Extremes of age are more prone to heat emergencies (i.e. young and old).
- Heat exposure can occur either due to increased environmental temperatures or prolonged exercise or a combination of both.
  - a. Environments with temperature *greater than 90°F* and humidity *greater than 60%* present the most risk.
- Contributory risk factors may come from:
  - a. Prescription and over-the-counter herbal supplements
  - b. Cold medications
  - c. Heart medications
  - d. Diuretics
  - e. Psychiatric medications
  - f. Drug abuse (i.e. cocaine, amphetamines and salicylates)
  - g. Accidental or intentional drug overdose
- Heat stroke is associated with cardiac arrhythmias independent of drug ingestion / overdose.
- Sweating *generally* disappears as body temperatures rise over 104°F although sweating (or lack of sweating) can be an unreliable indicator of the severity of heat illness.
- Do not forget to look for other causes of altered mental status such as low blood glucose level, or, in the proper circumstances (e.g. endurance exercise events), consider exercise associated hyponatremia (EAH), especially in the patient with altered mental status, normal blood glucose, and normal temperature.

## KEY DOCUMENTATION ELEMENTS

- Patient assessment includes medication / drug use and detailed past medical history
- Patient temperature and physical exam
- Environmental assessment performed
- Cooling interventions considered and implemented

## PERTINENT ASSESSMENT FINDINGS

- Warning signs: fever, altered mental status
- Blood glucose level for altered mental status

## QUALITY METRICS

- Blood glucose level obtained
- Fluids given for hypotension
- Attempts to reduce core temperature
- Documentation of estimated weight in kilograms

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# Environmental Hypothermia / Frostbite

## History

- Age
- Ambient temperature
- Exposure to wind / water
- Duration of exposure
- Past medical history / Medications

## Signs and Symptoms

- Altered mental status / Coma
- Cold, clammy
- Shivering
- Extremity pain or sensory abnormality
- Bradycardia
- Hypotension or shock

## Differential

- Metabolic disorders (hypoglycemia, hypothyroidism)
- Sepsis
- Environmental exposure
- Shock
- CNS dysfunction (stroke, brain injury, spinal cord injury)

## Hypothermia

### Classification

	Temperature	Signs & Symptoms
<b>Mild</b>	89.6°-95°F (32°-35°C)	Normal Vitals; Normal mental status; shivering is preserved; body maintains ability to control temperature.
<b>Moderate</b>	82.4°-89.6°F (28°-32°C)	Progressive bradycardia, hypotension, and decreased respirations, alterations in mental status with eventual coma, shivering will be lost in moderate hypothermia (generally between 31-30° C), and general slowing of bodily functions; the body loses ability to thermoregulate.
<b>Severe</b>	< 82.4°F (< 28°C)	

### EMR & EMT-Basic

1. **UNIVERSAL PATIENT CARE.**
2. Cautiously assess pulse for one full minute; unnecessary CPR could precipitate ventricular fibrillation. If patient has a pulse go to step #5.
3. If patient is pulseless and apneic after one full minute, refer to HYPOTHERMIC CARDIAC ARREST section.
4. Manage airway per the AIRWAY MANAGEMENT Protocol; assist ventilations with BVM but do not hyperventilate as hypocarbia may reduce the threshold for V-Fib in the cold patient.
5. Handle patient gently; DO NOT massage cold extremities.
6. Move patient to warm environment; remove any wet clothing and replace with dry sheets and blankets.
7. Hot packs may be applied to arm pits, groin and abdominal areas.
8. Assess and treat for other injuries as necessary.
9. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Administer **NORMAL SALINE 20 mL/kg** fluid bolus and reassess patient. Use warmed (102°-106°F) fluid if available.
4. May repeat fluid bolus as needed as long as lungs remain clear; maximum of **60 mL/kg**.

# Environmental Hypothermia / Frostbite

## **Frostbite**

### **Patient Presentation**

Patients with frostbite will develop numbness involving the affected body part along with a “clumsy” feeling and areas of blanched skin - later findings include decreased or loss of sensation, bruising or blister formation, white and waxy appearance to affected tissue, or feeling like a block of wood.

### **All Levels**

1. Remove from cold.
2. **UNIVERSAL PATIENT CARE.**
3. Do NOT massage frostbitten extremities.
4. Cover frostbitten nose or ears with a warm hand.
5. Have patient place frostbitten hand in his / her armpit.
6. If ETA is greater than 60 minutes, begin active rewarming:
  - a. Immerse extremity in circulating water maintained at a temperature of 100-105 F.
  - b. Rewarming should take 30-60 minutes.
  - c. Rewarming is complete when frozen area is warm to touch and deep red or bluish in color.
  - d. After rewarming, dry gently and cover part with dry sterile dressing and elevate on pillow.
  - e. Do NOT allow to refreeze.

# Environmental Hypothermia / Frostbite

## **Hypothermic Cardiac Arrest**

### **EMR & EMT-Basic**

1. Cautiously assess pulse for one full minute; unnecessary CPR could precipitate ventricular fibrillation.
2. Begin CPR and apply AED. Follow CARDIAC ARREST Protocol.
3. Manage airway per AIRWAY MANAGEMENT.
4. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

### **EMT-Intermediate & Paramedic**

1. Continue **EMR / BLS TREATMENT**.
2. Follow appropriate dysrhythmia protocol.
3. Establish IV access.
4. **NORMAL SALINE 20 mL/kg boluses**; use warm solution (102°-106°F) if available.

### **PEARLS**

#### **Hypothermic Cardiac Arrest**

- The following are contraindications for initiation of resuscitation in the hypothermic patient:
  - a. Obvious fatal injuries (such as decapitation).
  - b. The patient exhibits signs of being frozen (such as ice formation in the airway).
  - c. Chest wall rigidity such that compressions are impossible.
  - d. Danger to rescuers or rescuer exhaustion
- Fixed and dilated pupils, apparent rigor mortis, and dependent lividity may not be contraindication for resuscitation in the severely hypothermic patient.
- The mainstay of therapy in severe hypothermia and cardiac arrest should be effective chest compressions and attempts at rewarming. Chest compressions should be provided at the same rate as in normothermic patients.
- The temperature at which defibrillation should first be attempted in the severely hypothermic cardiac arrest victim and the number of defibrillation attempts is unclear. There are different approaches regarding resuscitation of the hypothermic arrest patient.
  - a. Per the American Heart Association (AHA), if the patient has a shockable rhythm (VF/VT), defibrillation should be attempted – it is reasonable to continue defibrillation attempts per AHA protocols concurrently with rewarming strategies.
- There is little evidence to guide use of medications in severe hypothermia with cardiac arrest, however 2010 AHA updates to advanced cardiac life support recommend use of vasopressors according to standard ACLS protocols.
- Patients with severe hypothermia and arrest may benefit from resuscitation even after prolonged downtime, and survival with intact neurologic function has been observed even after prolonged resuscitation.

# Environmental Hypothermia / Frostbite

## PEARLS

- Extremes of age are more susceptible (i.e. young and old).
- If the temperature is unable to be measured, treat the patient based on the suspected temperature.
- Given the additive effects of additional cold stress, the patient should be removed from the cold environment as soon as operationally feasible.
- In patients suffering from moderate to severe hypothermia, it is critical to not allow these patients to stand or exercise as this may cause circulatory collapse.
- Devices that self-generate heat (e.g. heat packs) that are being utilized during the rewarming process should be wrapped in a barrier to avoid direct contact with the skin and to prevent burns. In patients who are unresponsive, or unable to recognize a developing injury, please check the area in which the heating pad is placed regularly to ensure no tissue damage occurs.

## KEY DOCUMENTATION ELEMENTS

- Duration of cold exposure
- Ambient temperature
- Rewarming attempts or other therapies performed by EMS and prior to EMS arrival
- Patient use of alcohol and/or drugs

## PERTINENT ASSESSMENT FINDINGS

- Identification of associated traumatic injuries (when present)
- Identification of localized freezing injuries
- Patient core temperature (when available)

## QUALITY METRICS

- Patient core temperature and means of measurement (when available)
- Presence of cardiac dysrhythmias
- Documentation of associated trauma (when present)
- Blood glucose level obtained
- Documentation of estimated weight in kilograms

# Lightning / Lightning Strike Injury

## History

- Time of injury
- Past medical history
- Medications
- Other trauma
- Loss of consciousness

## Signs and Symptoms

- Respiratory distress / Apnea
- Dysrhythmias
- Seizures
- Dizziness / vertigo
- Loss of consciousness
- Paralysis
- Burns, pain, swelling
- Cardiopulmonary arrest

## Differential

- Burns—Superficial (1<sup>st</sup> Degree), Partial Thickness (2<sup>nd</sup> Degree), Full Thickness (3<sup>rd</sup> Degree)
- Cardiopulmonary arrest
- Altered mental status
- Seizures
- Dysrhythmias

## EMR & EMT-Basic

1. Ensure scene and rescuer safety. Recognize that repeat strike is a risk.
2. **UNIVERSAL PATIENT CARE.**
3. Assure patent airway. Refer to AIRWAY MANAGEMENT Protocol.
4. If in cardiopulmonary arrest, treat per CARDIAC ARREST Protocol.
5. Treat burns per BURNS Protocol.
6. Relay information to incoming ambulance or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate & Paramedic

1. Continue **EMR / BLS TREATMENT.**
2. Advanced airway management as indicated. Refer to AIRWAY MANAGEMENT Protocol.
3. Establish IV access.
4. Acquire 12-lead ECG. Monitor ECG for potential arrhythmias.
5. Consider early management of pain per the PAIN MANAGEMENT Protocol.

# Lightning / Lightning Strike Injury

## PEARLS

- Recognize that repeat strike is a risk. Patient and rescuer safety is paramount.
- Victims do not carry or discharge a current, so the patient is safe to touch and treat .
- Lightning strike cardiopulmonary arrest patients have a high rate of successful resuscitation, if initiated early, in contrast to general cardiac arrest statistics.
- There may be multiple victims.
- If multiple victims, cardiac arrest patients whose injury was witnessed or thought to be recent should be treated first and aggressively (reverse from traditional triage practices).
  - a. Patients suffering cardiac arrest from lightning strike initially suffer a combined cardiac and respiratory arrest.
  - b. Return of spontaneous circulation may precede resolution of respiratory arrest.
  - c. Patients may be successfully resuscitated if provided proper cardiac and respiratory support, highlighting the value of “reverse triage”.
- It may not be immediately apparent that the patient is a lightning strike victim.
- Injury pattern and secondary physical exam findings may be key in identifying patient as a victim of lightning strike.
- Fixed / dilated pupils may be a sign of neurologic insult, rather than a sign of death / impending death – Should not be used as a solitary, independent sign of death for the purpose of discontinuing resuscitation in this patient population.
- Lightning strike is a result of very high voltage, very short duration DC current exposure.

## KEY DOCUMENTATION ELEMENTS

- Initial airway status
- Initial cardiac rhythm
- Neurologic exam (initial and repeat)
- Associated / Secondary injuries
- Pain scale documentation / Pain management

## PERTINENT ASSESSMENT FINDINGS

- Presence of thermal or non-thermal burns
- Evidence of trauma
- Evidence of focal neurologic deficits

## QUALITY METRICS

- Patient transported to most appropriate hospital.
- Pain appropriately managed.
- Airway assessment and early and aggressive management



# Poisoning and Overdose

## History

- Ingestion or suspected ingestion of a potentially toxic substance
- Substance ingested, route, quantity
- Alcohol or other intoxicant ingested
- Time of ingestion
- Reason of ingestion (suicidal, accidental, criminal)
- Available medications at home
- Past medical history
- Medications

## Signs and Symptoms

- Mental status changes
- Hypotension / Hypertension
- Decreased respiratory rate
- Tachycardia, dysrhythmias
- Seizures
- SLUDGE / DUMBELS

\*See *TOXIDROME* section

## Differential

- Tricyclic antidepressants (TCAs)
- Acetaminophen (Tylenol)
- Aspirin
- Depressants
- Stimulants
- Anticholinergic
- Cardiac medications
- Solvents, Alcohols, Cleaning agents
- Insecticides (organophosphates)

## Toxidromes

### Anticholinergic

- Red as a beet (Flushed skin)
- Dry as a bone (Dry skin)
- Mad as a hatter (Altered mental status)
- Blind as a bat (Mydriasis)
- Hot as a pistol (Hyperthermia)
- Full as a flask (urinary retention)
- “Tachy” like a pink flamingo (tachycardia and hypertension)

### Cholinergic

(DUMBELS) DUMBELS is a mnemonic used to describe the signs and symptoms of acetylcholinesterase inhibitor agent poisoning. SLUDGEM is an alternative mnemonic.

- **D**iarrhea
- **U**rination
- **M**iosis/**M**uscle weakness
- **B**ronchospasm/**B**ronchorrhea/**B**radycardia (the killer Bs)
- **E**mesis
- **L**acrimation
- **S**alivation/**S**weating

### Opioids

- Respiratory depression
- Miosis (pinpoint pupils)
- Altered mental status
- Decreased bowel sounds

### Sedative Hypnotic

- Central nervous system depression
- Ataxia (unstable gait or balance)
- Slurred speech
- Normal or depressed vital signs (pulse, respirations, blood pressure)

### Stimulants / Hallucinogenics (Sympathomimetic)

- Tachycardia, tachydysrhythmias
- Hypertension
- Diaphoresis
- Delusions/paranoia
- Seizures
- Hyperthermia
- Mydriasis (dilated pupils)

### Serotonin Syndrome (presentation with at least three of the following)

- Agitation
- Ataxia
- Diaphoresis
- Diarrhea
- Hyperreflexia
- Mental status changes
- Myoclonus
- Shivering
- Tremor
- Hyperthermia
- Tachycardia

Protocol Continues

# Poisoning and Overdose

## EMR & EMT-Basic

1. Assure scene is safe and the patient has been decontaminated if needed.
2. **UNIVERSAL PATIENT CARE.**
3. Save all bottles, containers and labels for information. **DO NOT EXPOSE RESCUERS TO POISONOUS SUBSTANCES.**
4. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
5. If patient has inadequate respiratory effort from a confirmed or suspected opioid overdose, administer **intranasal NALOXONE** at **0.1 mg/kg** via atomizer (1 mL per nostril maximum). May repeat in 2-3 minutes to a maximum dose of 2 mg if no response. (Not given to restore consciousness)
  - a. **Infant / Toddler** (age 1-3): **NALOXONE 0.5 mg** (0.5 mL) per nostril for a total dose of **1 mg**.
  - b. **Small Child and Larger** (age > 3): **NALOXONE 1 mg** (1 mL) per nostril for a total dose of **2 mg**.
6. Relay information to incoming ambulance and/or call for intercept per INTERCEPT CRITERIA.

## EMT-Intermediate

1. Continue **EMR / BLS TREATMENT**.
2. Establish IV access.
3. Consider **NORMAL SALINE 20 mL/kg** fluid bolus to maintain age appropriate SBP. May repeat fluid bolus as needed to maintain age appropriate SBP as long as lungs remain clear.
4. Apply cardiac monitor to include pulse oximetry and waveform capnography.
  - a. Monitor ECG with special attention to rate, rhythm, QRS and QT duration
5. If patient has inadequate respiratory effort from a confirmed or suspected opioid overdose, administer **NALOXONE**: (*Titrate to adequate ventilation and oxygenation. Not given to restore consciousness.*)  
**IV, IM, IN – 0.1 mg/kg**; may repeat every 2-3 minutes to a maximum dose of 2 mg, if no response.
  - a. Use atomizer for IN administration with no more than 1 mL per nostril maximum.
6. If blood glucose < 60 mg/dL, refer to DIABETIC EMERGENCIES Protocol.
7. Contact Medical Control for agent specific treatment.

# Poisoning and Overdose

## Paramedic

1. Continue **ILS TREATMENT**.
2. Apply cardiac monitor to include pulse oximetry and waveform capnography.
  - a. Monitor ECG with special attention to rate, rhythm, QRS and QT duration.

<u>Overdose Agent</u>	<u>Treatment</u>
<b>Acetylcholinesterase Inhibitors</b> (Carbamates, Nerve Agents, Organophosphates) Exposure	1. Refer to <u>ACETYLCHOLINESTERASE INHIBITORS (CARBAMATES, NERVE AGENTS, ORGANOPHOSPHATES) EXPOSURE</u> Protocol.
<b>Beta Blocker and Calcium Channel Blocker</b>	1. For symptomatic bradycardia, refer to <u>BRADYCARDIA</u> Protocol. 2. For symptomatic patients with cardiac effects (i.e. hypotension, bradycardia) administer <b>GLUCAGON 0.1 mg/kg</b> (max 1 mg)
<b>Opioid</b>	1. If airway compromise or inadequate respiratory effort present from a confirmed or suspected opioid overdose, administer <b>NALOXONE:</b> <b>IV, IM, IN – 0.1 mg/kg</b> ; may repeat every 2-3 minutes to a <u>maximum dose of 2 mg</u> , if no response.
<b>Tricyclic Antidepressant</b>	1. If widened QRS (> 100 msec), administer <b>SODIUM BICARBONATE 1 mEq/kg IV</b> .

# Poisoning and Overdose

## PEARLS

- Each toxin or overdose has unique characteristics which must be considered in individual protocol.
- If possible, bring container / bottles, and/or contents with the patient to the Emergency Department.
- Monitor patient airway, breathing, pulse oximetry, EtCO<sub>2</sub> for adequate ventilation as they may change over time. Supportive care.
- Repeat vital signs often.
- Monitor level of consciousness.
- Monitor ECG with special attention to rate, rhythm, QRS and QT duration.
- Maintain or normalize patient temperature.
- Do not rely on patient history of ingestion, especially in suicide attempts.

## Specific Signs / Symptoms

- **Tricyclic:** 4 major areas of toxicity: seizures, dysrhythmias, hypotension, decreased mental status or coma; rapid progression from alert mental status to death.
- **Acetaminophen:** Initially normal or nausea / vomiting. If not detected and treated, causes irreversible liver failure.
- **Aspirin:** Early signs consist of abdominal pain and vomiting. Tachypnea and altered mental status may occur later. Renal dysfunction, liver failure, and or cerebral edema can take place later.
- **Depressants:** Bradycardia, hypotension, decreased temperature, decreased respirations, non-specific pupils.
- **Stimulants:** Tachycardia, hypertension, increased temperature, dilated pupils, seizures.
- **Anticholinergic:** Tachycardia, increased temperature, dilated pupils, mental status changes.
- **Cardiac Medications:** Dysrhythmias and mental status changes.
- **Solvents:** Nausea, coughing, vomiting, and mental status changes.
- **Insecticides:** Increased or decreased HR, increased secretions, nausea, vomiting, diarrhea, pinpoint pupils.

## KEY DOCUMENTATION ELEMENTS

- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Identification of possible etiology of poisoning
- Initiating measures on scene to prevent exposure of bystanders when appropriate / indicated
- Time of symptoms onset and time of initiation of exposure-specific treatment

## PERTINENT ASSESSMENT FINDINGS

- Frequent reassessment is essential as patient deterioration can be rapid and catastrophic

## QUALITY METRICS

- Early airway management in the rapidly deteriorating patient
- Accurate exposure history (Time, Route, Quantity, Alcohol or other intoxicants taken)
- Multiple frequent documented reassessments
- Documentation of estimated weight in kilograms

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# **East Central Illinois EMS System**



## **Medication Reference**

***2020***

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# ACETAMINOPHEN (Tylenol®)

<b>Class:</b>	Analgesic, Antipyretic
<b>Mechanism of Action:</b>	May work peripherally to block pain impulse generation; may also inhibit prostaglandin synthesis in CNS.
<b>Indications:</b>	Pain Control, Fever Control
<b>Contraindications:</b>	Hypersensitivity, Severe liver disease
<b>Side Effects:</b>	
<b>Adult Dose/Protocols:</b>	<u>Pain Management</u> ; <u>Sepsis</u> 1000 mg PO
<b>Pediatric Dose/Protocols:</b>	None



# ADENOSINE (Adenocard®)

<b>Class:</b>	Antidysrhythmic
<b>Mechanism of Action:</b>	Slows conduction through AV node and interrupts AV reentry pathways, which restore normal sinus symptoms.
<b>Indications:</b>	Conversion of regular, narrow complex tachycardia – stable supraventricular tachycardia (SVT) or regular, monomorphic wide complex tachycardia.
<b>Contraindications:</b>	Hypersensitivity, second or third degree AV Block (except those on pacemakers), sick sinus syndrome, atrial flutter or fibrillation, ventricular tachycardia
<b>Side Effects:</b>	Headache, dizziness, dyspnea, bronchospasm, dysrhythmias, palpitations, hypotension, chest pain, facial flushing, cardiac arrest, nausea, metallic taste, pain in the head or neck, paresthesia, diaphoresis
<b>Adult Dose/Protocols:</b>	<p><u>Tachycardia (with a Pulse)-Narrow Complex-Regular Rhythm</u></p> <p><b>6 mg rapid IV/IO</b> followed by a 10 mL NS flush.</p> <p>If no change in rhythm after 1-2 minutes, 12 mg rapid IV/IO followed by a 10 mL NS flush.</p> <p>If no change in rhythm after 1-2 minutes, repeat at 12 mg rapid IV/IO followed by a 10 mL NS flush.</p>
<b>Pediatric Dose/Protocols:</b>	<p><u>Tachycardia (with a Pulse)-Narrow Complex; Tachycardia (with a Pulse) - Wide Complex (regular rhythm and monomorphic)</u></p> <p><b>0.1 mg/kg (max 6 mg) rapid IV/IO</b> followed by a rapid NS flush.</p> <p>If no change in rhythm, give 0.2 mg/kg rapid IV/IO followed by a rapid NS flush.</p>

# ALBUTEROL /IPRATROPIUM (DuoNeb®)

<b>Class:</b>	<p><b>Albuterol:</b> Sympathomimetic; bronchodilator</p> <p><b>Ipratropium:</b> Anticholinergic; bronchodilator</p>
<b>Mechanism of Action:</b>	<p><b>Albuterol:</b> Selective beta-2 agonist that stimulates adrenergic receptors of the sympathetic nervous system. Results in smooth-muscle relaxation in the bronchial tree and peripheral vasculature.</p> <p><b>Ipratropium:</b> Inhibits interaction of acetylcholine at receptor sites of bronchial smooth muscle, resulting in decreased cyclic guanosine monophosphate and bronchodilation.</p>
<b>Indications:</b>	Persistent bronchospasm, COPD exacerbation
<b>Contraindications:</b>	Hypersensitivity to albuterol, ipratropium, atropine, alkaloids, peanuts.
<b>Side Effects:</b>	Headache, fatigue, dizziness, nervousness, tremors, tachycardia, hypertension, dysrhythmias, palpitations, chest pain, dry mouth, nausea, vomiting
<b>Adult Dose/Protocol:</b>	<p><u>Allergic Reaction / Anaphylaxis; Bronchospasm / Asthma / COPD; Respiratory Distress—Tracheostomy</u></p> <p><b>DuoNeb</b> ( albuterol sulfate 3.0 mg and ipratropium bromide 0.5 mg) <b>by nebulizer</b>. May repeat x2 if needed for continued symptomatic relief</p>
<b>Pediatric Dose/Protocol:</b>	<p><u>Allergic Reaction / Anaphylaxis; Respiratory Distress—Lower Airway; Respiratory Distress—Tracheostomy</u></p> <p><b>DuoNeb</b> ( albuterol sulfate 3.0 mg and ipratropium bromide 0.5 mg) <b>by nebulizer</b>. May repeat x2 if needed for continued symptomatic relief</p>

# AMIODARONE (Pacerone®, Cordarone®)

<b>Class:</b>	Antidysrhythmic (Class III)
<b>Mechanism of Action:</b>	Blocks sodium, potassium, and calcium channels; prolongs the action potential and repolarization; decreases AV conduction and sinoatrial (SA) node function.
<b>Indications:</b>	Management of regular wide complex tachycardia in stable patients, irregular wide complex tachycardia in stable patients, and as antidysrhythmic for the management of ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT).
<b>Contraindications:</b>	Hypersensitivity, severe sinus node dysfunction, second or third degree heart block or bradycardia causing syncope (except with functioning artificial pacemaker), cardiogenic shock
<b>Side Effects:</b>	Dizziness, fatigue, malaise, tremor, ataxia, lack of coordination, ARDS, pulmonary edema, cough, progressive dyspnea, heart failure, bradycardia, hypotension, worsening of dysrhythmias, prolonged QT interval, nausea, vomiting, burning at IV site, Stevens-Johnson syndrome
<b>Adult Dose/Protocols:</b>	<p><u>Tachycardia (with a Pulse)-Wide Complex</u></p> <p><b>150 mg IV/IO</b> over 10 minutes. May repeat every 10 minutes until wide complex tachycardia resolves to a maximum dose of 450 mg.</p> <p><u>Cardiac Arrest-(VFib / Pulseless V-tach)</u></p> <p><b>300 mg IV/IO</b>; may repeat at 150 mg IV/IO in 5 minutes if needed.</p>
<b>Pediatric Dose/Protocols:</b>	<p><u>Tachycardia (with a Pulse)-Wide Complex</u></p> <p><b>5 mg/kg (max 150 mg) IV/IO</b> over 20-60 minutes.</p> <p><u>Cardiac Arrest-(VFib / Pulseless V-tach)</u></p> <p><b>5 mg/kg IV/IO (max 300mg)</b>. May repeat x2 at 5 mg/kg IV/IO every 5 minutes if needed. (Max total dose 15 mg/kg).</p>

# ASPIRIN

<b>Class:</b>	Platelet inhibitor, anti-inflammatory agent
<b>Mechanism of Action:</b>	Inhibits synthesis of prostaglandin by cyclooxygenase; inhibits platelet aggregation; has antipyretic and analgesic activity.
<b>Indications:</b>	Antiplatelet agent for the care of patients suspected of suffering from an acute coronary syndrome.
<b>Contraindications:</b>	Hypersensitivity. Relatively contraindicated in patients with active ulcer disease or asthma.
<b>Side Effects:</b>	Bronchospasm, anaphylaxis, wheezing in allergic patients, prolonged bleeding, GI bleeding, epigastric distress, nausea, vomiting, heartburn, Reye syndrome
<b>Adult Dose/Protocols:</b>	<u>Chest Pain/Acute Coronary Syndrome/STEMI</u> <b>325 mg PO or 81 mg x 4 PO</b> ; chewable, non-enteric-coated aspirin preferred.
<b>Pediatric Dose/Protocols:</b>	None

# ATROPINE SULFATE

<b>Class:</b>	Anticholinergic agent
<b>Mechanism of Action:</b>	Inhibits action of acetylcholine at parasympathetic sites in smooth muscle, CNS and secretory glands. Increases cardiac output and dries secretions.
<b>Indications:</b>	Hemodynamically unstable bradycardia, organophosphate poisoning, nerve agent exposure, RSI in pediatrics, beta-blocker or calcium channel blocker overdose.
<b>Contraindications:</b>	Tachycardia, hypersensitivity, unstable cardiovascular status in acute hemorrhage with myocardial ischemia, narrow-angle glaucoma, hypothermic bradycardia
<b>Side Effects:</b>	Drowsiness, confusion, headache, tachycardia, palpitations, dysrhythmias, nausea, vomiting, pupil dilation, dry mouth/nose/skin, blurred vision, urinary retention, constipation, flushed, hot, dry skin; paradoxical bradycardia when pushed too slowly or when given at low doses
<b>Adult Dose/Protocols:</b>	<u>Bradycardia</u> <b>1 mg IV/IO</b> every 3-5 minutes, as long as symptomatic bradycardia persists, to a total dose of 3 mg. <u>Acetylcholinesterase Inhibitors</u> <b>2 mg IV or IM</b> ; repeat at 2-4 mg IV q 3-5 minutes until symptoms of SLUDGE subside, most importantly secretions.

Medication Continues 

# ATROPINE SULFATE

## Pediatric Dose/ Protocols:

### Bradycardia

**0.02 mg/kg IV/IO** for increased vagal tone or primary AV block (minimum single dose: 0.1 mg; maximum single dose: 0.5 mg); May be repeated once in 3-5 minutes.

### Acetylcholinesterase Inhibitors

	<b>MILD / MODERATE</b> <b>(0.05 mg/kg IM)</b>	<b>SEVERE</b> <b>(0.1 mg/kg IM)</b>
<b>Infant</b> 0-6 Months	0.25 mg IM	0.5 mg IM
<b>Infant</b> 7 mo - 2 yrs	0.5 mg IM	1 mg IM
<b>Child</b> 3-7 yrs (14-25 kg)	1 mg IM	2 mg IM
<b>Child</b> 8-14 yrs (26-50 kg)	2 mg IM	4 mg IM
<b>Adolescent</b> > 14 yrs (> 51 kg)	2 mg IM	4 mg IM

# BENZOCAINE SPRAY (Cetacaine®, Hurricane Spray®)

<b>Class:</b>	Topical anesthetic.
<b>Mechanism of Action:</b>	Stabilizes neuronal membrane, which blocks the initiation and conduction of nerve impulses.
<b>Indications:</b>	Used as a topical anesthetic to facilitate passage of diagnostic and treatment devices. Suppressed the pharyngeal and tracheal gag reflex.
<b>Contraindications:</b>	Hypersensitivity.
<b>Side Effects:</b>	Methemoglobinemia has been reported on extremely rare occasions following the use of benzocaine.
<b>Adult Dose/Protocols:</b>	<u>Medication Assisted Intubation</u> 1 - 2 second spray; may repeat once after 30 seconds, if needed.
<b>Pediatric Dose/Protocols:</b>	None.

# DEXTROSE

<b>Class:</b>	Carbohydrate, antihypoglycemic
<b>Mechanism of Action:</b>	Rapidly increases serum glucose levels. Short term osmotic diuresis.
<b>Indications:</b>	Hypoglycemia, altered level of consciousness, coma of unknown origin, seizure of unknown origin, status epilepticus
<b>Contraindications:</b>	Intracranial hemorrhage
<b>Side Effects:</b>	Extravasation leads to tissue necrosis. Cerebral hemorrhage, cerebral ischemia, pulmonary edema, warmth, pain, burning from IV infusion, hyperglycemia.
<b>Adult Dose/Protocol:</b>	<p><u>Altered Mental Status; Diabetic Emergencies</u></p> <p><b>DEXTROSE 10% (D10) 25 grams</b>; administer in <b>50 mL (5g) IV</b> aliquots.</p> <p><b>DEXTROSE 50% (D50) 25 grams IV</b></p>
<b>Pediatric Dose/Protocol:</b>	<p><u>Altered Mental Status; Diabetic Emergencies</u></p> <p><b>DEXTROSE 10% (D10) 5 mL/kg IV</b></p>



# DILTIAZEM (Cardizem®)

<b>Class:</b>	Calcium channel blocker, antidysrhythmic (Class IV)
<b>Mechanism of Action:</b>	Inhibits extracellular calcium ion influx across membranes of myocardial cells and vascular smooth muscle cells, resulting in inhibition of cardiac and vascular smooth muscle contraction and thereby dilating main coronary and systemic arteries; no effect on serum calcium concentrations; substantial inhibitory effects on cardiac conduction system, acting principally at AV node, with some effects at sinus node
<b>Indications:</b>	For management of narrow complex tachycardias and to control the ventricular rate in patients with AF or atrial flutter
<b>Contraindications:</b>	Documented hypersensitivity, Wolff-Parkinson-White syndrome, Lown-Ganong-Levine syndrome, symptomatic severe hypotension (systolic BP < 90 mm Hg), sick sinus syndrome (if no pacemaker), second and third degree heart block (if no pacemaker present), and complete heart block
<b>Side Effects:</b>	Dizziness, weakness, headache, dyspnea, cough, dysrhythmias, heart failure, peripheral edema, bradycardia, hypotension, AV blocks, syncope, VF, VT, cardiac arrest, chest pain, nausea, vomiting, dry mouth
<b>Adult Dose/Protocols:</b>	<p><u>Tachycardia (with a Pulse)-Narrow Complex-Irregular Rhythm</u>  <b>0.25 mg/kg slow IV/IO</b> over 2-5 minutes if SBP &gt; 100 mmHg. (ACLS guidelines recommend 15 to 20 mg; max dose 20 mg)            For patients older than 65, recommended initial dose of 10 mg)            If A-fib or A-flutter persists after 15 minutes, repeat at 0.35 mg/kg slow IV/IO over 2-5 minutes if SBP &gt; 100 mmHg.            (ACLS guidelines recommend 20 to 25 mg; max dose 25 mg; For patients older than 65, recommended second dose of 20 mg)            If responsive to bolus, may start maintenance infusion at 10-15 mg/hr:</p> <ol style="list-style-type: none"> <li>a. Mix 100 mg in 100 mL 0.9% Normal Saline to give you 1 mg/mL concentration.</li> <li>b. Use 60 gtts IV set and 10-15 gtts/minute is equivalent to 10-15 mg/hr.</li> </ol>
<b>Pediatric Dose/Protocols:</b>	None

# DIPHENHYDRAMINE (Benadryl®)

<b>Class:</b>	Antihistamine (H1 blocker)
<b>Mechanism of Action:</b>	Histamine H1-receptor antagonist of effector cells in respiratory tract, blood vessels, and GI smooth muscle.
<b>Indications:</b>	For urticarial and/or pruritis in the management of patients suffering from allergic reaction as well as for the management of patents suffering from dystonia/akasthesia.
<b>Contraindications:</b>	Documented hypersensitivity, use controversial in lower respiratory tract disease (such as acute asthma), premature infants and neonates.
<b>Side Effects:</b>	Drowsiness, sedation, seizures, dizziness, headache, blurred vision, wheezing, thickening of bronchial secretions, palpitations, hypotension, dysrhythmias, dry mouth, diarrhea, nausea, vomiting. Hallucinations, confusion and paradoxical CNS excitation can occur in children.
<b>Adult Dose/Protocols:</b>	<u>Allergic Reaction/Anaphylaxis</u> <b>50 mg IV/IM/IO/PO</b>
<b>Pediatric Dose/Protocols:</b>	<u>Allergic Reaction/Anaphylaxis</u> <b>1 mg/kg IM/IV/IO (max dose 50 mg)</b>

# DOPAMINE (Intropin®)

<b>Class:</b>	Adrenergic, vasopressor, inotropic agent
<b>Mechanism of Action:</b>	Endogenous catecholamine, acting on both dopaminergic and adrenergic neurons. Low dose stimulates mainly dopaminergic receptors, producing renal and mesenteric vasodilation; higher dose stimulates both beta-1-adrenergic and dopaminergic receptors, producing cardiac stimulation and renal vasodilation; large dose stimulates alpha-adrenergic receptors.
<b>Indications:</b>	Cardiogenic and septic shock, hypotension with low cardiac output states, distributive shock, second-line drug for symptomatic bradycardia.
<b>Contraindications:</b>	Hypersensitivity to dopamine, hypovolemic shock, pheochromocytoma, ventricular fibrillation, uncorrected tachyarrhythmias
<b>Side Effects:</b>	Extravasation may cause tissue necrosis. Headache, anxiety, dyspnea, dysrhythmias, hypotension, hypertension, palpitations, chest pain, increased myocardial oxygen demand, nausea, vomiting
<b>Adult Dose/Protocols:</b>	<u>Bradycardia</u> ; <u>CHF / Pulmonary Edema</u> ; <u>ROSC</u> ; <u>Sepsis</u> ; <u>Shock</u> 5 mcg/kg/min titrated to a SBP of 90-100 mmHg or MAP > 65 mmHg.
<b>Pediatric Dose/Protocols:</b>	<u>ROSC</u> ; <u>Sepsis</u> ; <u>Shock</u> 5 mcg/kg/min titrated to age appropriate SBP.

(See Drip charts on next page)



# DOPAMINE (Intropin®)

## Adult Dopamine Drip Chart

*Dopamine is provided premixed (400mg in 250mL D5W or 800mg in 500mL D5W).  
This yields a concentration of 1600mcg/mL.*

Dose mcg/kg/min	2	3	4	5	6	7	8	9	10	15	20
Weight Lbs/kg	Flow rate in ml/hr (In the absence of an IV pump, use 60 drop tubing and ml/hr=drops/min)										
90 lbs/41 kg	3	5	6	8	9	11	12	14	15	23	31
100 lbs/45 kg	3	5	7	8	10	12	14	15	17	25	34
110 lbs/50 kg	4	6	8	9	11	13	15	17	19	28	38
120 lbs/55 kg	4	6	8	10	12	14	17	19	21	31	41
130 lbs/59 kg	4	7	9	11	13	15	18	20	22	33	44
140 lbs/64 kg	5	7	10	12	14	17	19	22	24	36	48
150 lbs/68 kg	5	8	10	13	15	18	20	23	26	38	51
160 lbs/73 kg	5	8	11	14	16	19	22	25	27	41	55
170 lbs/77 kg	6	9	12	14	17	20	23	26	29	43	58
180 lbs/82 kg	6	9	12	15	18	22	25	28	31	46	62
190 lbs/86 kg	6	10	13	16	19	23	26	29	32	48	65
200 lbs/91 kg	7	10	14	17	20	24	27	31	34	51	68
210 lbs/95 kg	7	11	14	18	21	25	29	32	36	53	71
220 lbs/100 kg	8	11	15	19	23	26	30	34	38	56	75
230 lbs/105 kg	8	12	16	20	24	28	32	35	39	59	79
240 lbs/109 kg	8	12	16	20	25	29	33	37	41	61	82
250 lbs/114 kg	9	13	17	21	26	30	34	38	43	64	86
260 lbs/118 kg	9	13	18	22	27	31	35	40	44	66	89
270 lbs/123 kg	9	14	18	23	28	32	37	42	46	69	92
280 lbs/127 kg	10	14	19	24	29	33	38	43	48	71	95
290 lbs/132 kg	10	15	20	25	30	35	40	45	50	74	99
300 lbs/136 kg	10	15	20	26	31	36	41	46	51	77	102



# DOPAMINE (Intropin®)

## Pediatric Dopamine Drip Chart

**Dopamine is provided premixed (400mg in 250mL D5W or 800mg in 500mL D5W).  
This yields a concentration of 1600mcg/mL.**

Dose mcg/kg/min	2	3	4	5	6	7	8	9	10	15	20
Weight Lbs/kg	Flow rate in ml/hr (In the absence of an IV pump, use 60 drop tubing and ml/hr=drops/min)										
20 lbs/9 kg	1	1	1	2	2	2	3	3	3	5	7
25 lbs/11 kg	1	1	2	2	2	3	3	4	4	6	8
30 lbs/14 kg	1	2	2	3	3	4	4	5	5	8	11
35 lbs/16 kg	1	2	2	3	4	4	5	5	6	9	12
40 lbs/18 kg	1	2	3	3	4	5	5	6	7	10	14
45 lbs/20 kg	2	2	3	4	5	5	6	7	8	11	15
50 lbs/23 kg	2	3	3	4	5	6	7	8	9	13	17
55 lbs/25 kg	2	3	4	5	6	7	8	8	9	14	19
60 lbs/27 kg	2	3	4	5	6	7	8	9	10	15	20
65 lbs/29 kg	2	3	4	5	7	8	9	10	11	16	22
70 lbs/32 kg	2	4	5	6	7	8	10	11	12	18	24
75 lbs/34 kg	3	4	5	6	8	9	10	11	13	19	26
80 lbs/36 kg	3	4	5	7	8	9	11	12	14	20	27
85 lbs/39 kg	3	4	6	7	9	10	12	13	15	22	29
90 lbs/41 kg	3	5	6	8	9	11	12	14	15	23	31

# EPINEPHRINE (Adrenalin®)

<b>Class:</b>	Sympathomimetic
<b>Mechanism of Action:</b>	Strong alpha-adrenergic effects, which cause an increase in cardiac output and heart rate, a decrease in renal perfusion and peripheral vascular resistance, and a variable effect on BP, resulting in systemic vasoconstriction and increased vascular permeability. Strong beta-1- and moderate beta-2-adrenergic effects, resulting in bronchial smooth muscle relaxation. Secondary relaxation effect on smooth muscle of stomach, intestine, uterus, and urinary bladder.
<b>Indications:</b>	Cardiac arrest (asystole, PEA, VF and pulseless VT), symptomatic bradycardia as an alternative infusion to dopamine, hypotension from shock other than hypovolemia, allergic reaction, anaphylaxis, asthma.
<b>Contraindications:</b>	None in the emergency setting. Relative contraindications include hypertension, hypothermia, pulmonary edema, myocardial ischemia, hypovolemic shock.
<b>Side Effects:</b>	Nervousness, restlessness, headache, tremor, pulmonary edema, dysrhythmias, chest pain, hypertension, tachycardia, nausea, vomiting
<b>Adult Dose/Protocols:</b>	<p><u>Cardiac Arrest-(Asystole/PEA); Cardiac Arrest-(V-Fib/Pulseless V-Tach)</u></p> <p><b>1.0 mg 1:10,000 IV/IO</b> every 3-5 minutes as long as patient remains pulseless</p> <p><u>Allergic Reaction / Anaphylaxis</u></p> <p><b>0.3 mg 1:1000 IM</b> every 5-15 minutes (max 3 doses)</p> <p><u>Bronchospasm / Asthma / COPD</u></p> <p><b>0.3 mg 1:1000 IM</b></p> <p><u>Bradycardia; CHF / Pulmonary Edema; ROSC; Sepsis; Shock</u></p> <p><b>PUSH DOSE EPINEPHRINE 1 mL (10 mcg) IV/IO</b> every 2-5 minutes to maintain SBP of 90-100 mmHg or MAP &gt; 65 mmHg (Mix 1 mL of Epinephrine 1:10,000 with 9 mL of Normal Saline in a 10 mL syringe resulting in a concentration of 10 mcg/ml)</p>

Medication Continues

# EPINEPHRINE (Adrenalin®)

## Pediatric Dose/ Protocols:

## Pediatric Dose/Protocols:

Cardiac Arrest-(Asystole/PEA); Bradycardia; Neonatal Resuscitation; Cardiac Arrest-(V-Fib/Pulseless V-Tach)

**0.01 mg/kg 1:10,000 IV/IO** every 3-5 minutes as long as patient remains pulseless.

Allergic Reaction / Anaphylaxis

BLS Providers:

< 30 kg **0.15 mg 1:1000 IM**

≥ 30 kg **0.3 mg 1:1000 IM**

ILS/ALS Providers:

**0.01 mg/kg 1:1000 IM**

Every 5-15 minutes (max 3 doses)

Respiratory Distress-Lower Airway

**0.01 mg/kg 1:1000 IM** (max dose 0.3 mg)

# EPINEPHRINE RACEMIC (MicroNefrin®)

<b>Class:</b>	Sympathomimetic
<b>Mechanism of Action:</b>	Stimulates beta-2 receptors in lungs: bronchodilation with relaxation of bronchial smooth muscles. Reduces airway resistance. Useful in treating laryngeal edema; inhibits histamine release.
<b>Indications:</b>	Bronchial asthma, prevention of bronchospasm, croup, laryngeal edema
<b>Contraindications:</b>	Hypertension, underlying cardiovascular disease, epiglottitis
<b>Side Effects:</b>	Headache, anxiety, fear, nervousness, respiratory weakness, palpitations, tachycardia, dysrhythmias, nausea, vomiting
<b>Adult Dose/Protocols:</b>	None
<b>Pediatric Dose/Protocols:</b>	<u>Respiratory Distress—Upper Airway</u> 0.5 mL of 2.25% solution diluted in 3 mL NS nebulized.



# FENTANYL (Sublimaze®)

<b>Class:</b>	Opioid analgesic; schedule II drug
<b>Mechanism of Action:</b>	Binds to opiate receptors, producing analgesia and euphoria.
<b>Indications:</b>	Pain management, anesthesia adjunct
<b>Contraindications:</b>	Hypersensitivity. Use with caution in traumatic brain injury.
<b>Side Effects:</b>	Confusion, paradoxical excitation, delirium, drowsiness, CNS depression, sedation, respiratory depression, apnea, dyspnea, dysrhythmias, bradycardia, tachycardia, hypotension, syncope, nausea, vomiting, abdominal pain, dehydration, fatigue
<b>Adult Dose/Protocols:</b>	<p><u>Pain Management</u></p> <p><b>1 mcg/kg IV/IO/IM/IN</b> (max initial dose 100 mcg); Recommended initial dose: 50 mcg; may repeat x 1 after 15 minutes at 0.5 mcg/kg (max second dose 50 mcg).</p> <p>a. IV/IO is a slow push over 2-3 minutes</p> <p><u>Medication Assisted Intubation</u></p> <p><b>1 mcg/kg IV/IO</b> (max initial dose 100 mcg); may repeat x 1 after 3-5 minutes at 0.5 mcg/kg (max second dose 50 mcg).</p> <p><u>Chest Pain</u></p> <p><b>1 mcg/kg slow IV/IO</b> over 2 minutes (max initial dose 100 mcg).</p>
<b>Pediatric Protocols:</b>	<p><u>Pain Management</u></p> <p><b>1 mcg/kg IV/IO/IM/IN</b> (max initial dose 100 mcg); Recommended initial dose: 50 mcg; may repeat x 1 after 15 minutes at 0.5 mcg/kg (max second dose 50 mcg).</p> <p>a. IV/IO is a slow push over 2-3 minutes</p>

# GLUCAGON (GlucaGen®)

<b>Class:</b>	Hypoglycemia antidotes, glucose-elevating agents, other antidotes (e.g. beta-blocker or calcium channel blocker overdose).
<b>Mechanism of Action:</b>	Insulin antagonist. Stimulates cAMP synthesis to accelerate hepatic glycogenolysis and gluconeogenesis. Glucagon also relaxes smooth muscles of GI tract.
<b>Indications:</b>	For the management of hypoglycemic patients as well as patients suffering symptomatic bradycardia after beta blocker or calcium channel blocker overdose.
<b>Contraindications:</b>	Hypersensitivity, hyperglycemia
<b>Side Effects:</b>	Dizziness, headache, hypertension, tachycardia, nausea, vomiting, rebound hypoglycemia
<b>Adult Dose/Protocols:</b>	<p><u>Altered Mental Status; Diabetic Emergencies;</u></p> <p><b>1 mg IM/IN</b></p> <p><u>Poisoning and Overdose (Beta Blocker and Calcium Channel Blocker)</u></p> <p><b>2mg IV/IM</b></p>
<b>Pediatric Dose/Protocols:</b>	<p><u>Altered Mental Status; Diabetic Emergencies</u></p> <p>&lt; 20 kg: <b>0.5 mg IM/IN</b></p> <p>&gt; 20 kg: <b>1 mg IM/IN</b></p> <p><u>Poisoning and Overdose</u></p> <p><b>0.1 mg/kg (max 1 mg)</b></p>

# KETAMINE (Ketelar®)

<b>Class:</b>	Sedative, analgesic dissociative anesthetic
<b>Mechanism of Action:</b>	Blocks pain receptors and minimizes spinal cord activity, affecting the association pathways of the brain between the thalamus and limbic system.
<b>Indications:</b>	Excited delirium, pain management, procedural sedation
<b>Contraindications:</b>	Hypersensitivity, conditions where hypertension would be hazardous to the patient's care.
<b>Side Effects:</b>	Hypertension, dysrhythmia, bronchodilation, respiratory depression
<b>Adult Dose/Protocols:</b>	<u>Agitated or Violent Patient/Behavioral Emergencies</u> <b>IM: 4 mg/kg</b> <b>IV: 2 mg/kg</b>
<b>Pediatric Dose/Protocols:</b>	None

# KETOROLAC (Toradol®)

<b>Class:</b>	Non-steroidal anti-inflammatory drug (NSAID)
<b>Mechanism of Action:</b>	Potent analgesic that does not possess any sedative or anxiolytic activities by inhibiting prostaglandin synthesis.
<b>Indications:</b>	Short-term management of moderate to severe pain.
<b>Contraindications:</b>	Allergy to aspirin, ketorolac, or other NSAIDs; Pregnant females; Patients with history of asthma, bleeding disorders (especially GI related, such as peptic ulcer disease), renal
<b>Side Effects:</b>	Drowsiness, dizziness, headache, sedation, bronchospasm, dyspnea, edema, vasodilation, hypotension, hypertension, GI bleeding, diarrhea, dyspepsia, nausea
<b>Adult Dose/Protocols:</b>	<u>Pain Management</u> <b>30 mg IM or 15 mg IV (no repeat dose)</b>
<b>Pediatric Dose/Protocols:</b>	None

# LIDOCAINE (Xylocaine®)

<b>Class:</b>	Antidysrhythmic (Class Ib), anesthetic
<b>Mechanism of Action:</b>	Cardiac: Decreases automaticity by slowing the rate of spontaneous phase 4 depolarization.  Local anesthetic: Inhibits transport of ions across the neuronal membrane, blocking conduction of normal nerve impulses.
<b>Indications:</b>	Alternate to amiodarone in cardiac arrest from VT, VF, Stable wide-complex tachycardia (poly-or monomorphic) with normal baseline QT interval. Also used as a local anesthetic for various procedures, including intubation and IO infusion.
<b>Contraindications:</b>	Hypersensitivity to lidocaine or amide-type local anesthetic, Adams-Stokes syndrome, SA/AV/intraventricular heart block in the absence of artificial pacemaker. CHF, cardiogenic shock, second and third degree heart block (if no pacemaker is present), Wolff-Parkinson-White Syndrome
<b>Side Effects:</b>	Anxiety, drowsiness, confusion, seizures, slurred speech, respiratory arrest, hypotension, bradycardia, dysrhythmias, cardiac arrest, AV block, nausea, vomiting
<b>Adult Dose/Protocols:</b>	<u>Tachycardia (with a Pulse)-Wide Complex; Cardiac Arrest-(VFib / Pulseless V-tach)</u>  <b>1.5 mg/kg IV/IO</b> ; may repeat every 3-5 minutes x 2 at 0.75 mg/kg to maximum of 3 mg/kg.  If tachycardia resolves with bolus, administer maintenance infusion at 2-4 mg/min.  <u>Intraosseous Access-Responsive to pain</u>  <b>40 mg IO</b> over 120 seconds
<b>Pediatric Dose/Protocols:</b>	<u>Tachycardia (with a Pulse)-Wide Complex</u>  <b>1 mg/kg IV/IO.</b>  <u>Cardiac Arrest-(VFib / Pulseless V-tach)</u>  <b>1 mg/kg IV/IO.</b>  Maintenance infusion at 20-50 mcg/kg/min.  <u>Intraosseous Access-Responsive to pain</u>  <b>0.5 mg/kg mg IO</b> over 120 seconds (max 40 mg)

(See drip charts on next page)



# LIDOCAINE (Xylocaine®)

## Lidocaine Drip Chart

*Lidocaine is provided premixed (2000 mg in 250 mL D5W) which yields a concentration of 8 mg/mL or (1000 mg in 250 mL D5W) which yields a concentration of 4 mg/mL.*

(In the absence of an IV pump, use 60 drop tubing and mL/hr=drops/min)

### Concentration: 8 mg/mL

Order	Flow rate mL/hr
2 mg/min	15 mL/hr
3 mg/min	23 mL/hr
4 mg/min	30 mL/hr

### Concentration: 4 mg/mL

Order	Flow rate mL/hr
2 mg/min	30 mL/hr
3 mg/min	45 mL/hr
4 mg/min	60 mL/hr

Medication Continues 

# LIDOCAINE (Xylocaine®)

## Pediatric Lidocaine Drip Chart

Lidocaine is provided premixed (2000 mg in 250 mL D5W) which yields a concentration of 8 mg/mL or (1000 mg in 250 mL D5W) which yields a concentration of 4 mg/mL.

(In the absence of an IV pump, use 60 drop tubing and mL/hr=drops/min)

Concentration: 8 mg / mL

Dose mcg/kg/min	20	25	30	35	40	45	50
Weight (lbs/kg)	Flow rate in mL/hr						
10 lbs/5 kg	1	1	1	1	2	2	2
20 lbs/9 kg	1	2	2	2	3	3	3
25 lbs/11 kg	2	2	2	3	3	4	4
30 lbs/14 kg	2	3	3	4	4	5	5
35 lbs/16 kg	2	3	4	4	5	5	6
40 lbs/18 kg	3	3	4	5	5	6	7
45 lbs/20 kg	3	4	5	5	6	7	8
50 lbs/23 kg	3	4	5	6	7	8	9
55 lbs/25 kg	4	5	6	7	8	8	9
60 lbs/27 kg	4	5	6	7	8	9	10
65 lbs/29 kg	4	5	7	8	9	10	11
70 lbs/32 kg	5	6	7	8	10	11	12
75 lbs/34 kg	5	6	8	9	10	11	13
80 lbs/36 kg	5	7	8	9	11	12	14
85 lbs/39 kg	6	7	9	10	12	13	15
90 lbs/41 kg	6	8	9	11	12	14	15

Medication Continues 

# LIDOCAINE (Xylocaine®)

## Pediatric Lidocaine Drip Chart

Lidocaine is provided premixed (2000 mg in 250 mL D5W) which yields a concentration of 8 mg/mL or (1000 mg in 250 mL D5W) which yields a concentration of 4 mg/mL.

(In the absence of an IV pump, use 60 drop tubing and mL/hr=drops/min)

### Concentration: 4 mg / mL

Dose mcg/kg/min	20	25	30	35	40	45	50
Weight lbs/kg	Flow rate in mL/hr						
10 lbs/5 kg	2	2	2	3	3	3	4
20 lbs/9 kg	3	3	4	5	5	6	7
25 lbs/11 kg	3	4	5	6	7	7	8
30 lbs/14 kg	4	5	6	7	8	9	11
35 lbs/16 kg	5	6	7	8	10	11	12
40 lbs/18 kg	5	7	8	9	11	12	14
45 lbs/20 kg	6	8	9	11	12	14	15
50 lbs/23 kg	7	9	10	12	14	16	17
55 lbs/25 kg	8	9	11	13	15	17	19
60 lbs/27 kg	8	10	12	14	16	18	20
65 lbs/29 kg	9	11	13	15	17	20	22
70 lbs/32 kg	10	12	14	17	19	22	24
75 lbs/34 kg	10	13	15	18	20	23	26
80 lbs/36 kg	11	14	16	19	22	24	27
85 lbs/39 kg	12	15	18	20	23	26	29
90 lbs/41 kg	12	15	18	22	25	28	31



# MAGNESIUM SULFATE

<b>Class:</b>	Class V antidysrhythmic, electrolyte
<b>Mechanism of Action:</b>	Depresses CNS, blocks peripheral neuromuscular transmission, produces anticonvulsant effects; decreases amount of acetylcholine released at end-plate by motor nerve impulse. Slows rate of sino-atrial (SA) node impulse formation in myocardium and prolongs conduction time. Promotes movement of calcium, potassium, and sodium in and out of cells and stabilizes excitable membranes.
<b>Indications:</b>	For the management of torsades de pointes or for severe bronchoconstriction with impending respiratory failure, seizure during the third trimester of pregnancy or in the postpartum patient.
<b>Contraindications:</b>	Hypersensitivity, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia
<b>Side Effects:</b>	Drowsiness, CNS depression, respiratory depression, respiratory tract paralysis, abnormal ECG, AV block, hypotension, vasodilation, hyporeflexia
<b>Adult Dose/Protocols:</b>	<p><u>Bronchospasm / Asthma / COPD</u>  <b>2 grams IV in 50 mL NS</b> over 10-15 minutes.</p> <p><u>Eclampsia / Pre-Eclampsia</u>  <b>4 grams IV in 50 mL NS</b> over 10-20 minutes for seizures</p> <p><u>Tachycardia (with a Pulse)-Wide Complex</u>  <b>2 grams IV/IO</b> over 10 minutes.</p> <p><u>Cardiac Arrest-(V-Fib/Pulseless V-Tach)</u>  <b>2 grams IV/IO</b> over 1-2 minutes.</p>
<b>Pediatric Dose/ Protocols:</b>	<p><u>Respiratory Distress-Lower Airway</u>  <b>50 mg/kg IV in 50 mL NS</b> over 10-15 minutes. Maximum dose: 2 grams.</p> <p><u>Tachycardia (with a Pulse)-Wide Complex</u>  <b>25-50 mg/kg IV/IO</b> over 10 minutes. Maximum dose: 2 grams</p> <p><u>Cardiac Arrest-(V-Fib/Pulseless V-Tach)</u>  <b>25-50 mg/kg IV/IO</b> over 1-2 minutes.</p>

# METHYLPREDNISOLONE (SoluMedrol®)

<b>Class:</b>	Corticosteroid, anti-inflammatory agent
<b>Mechanism of Action:</b>	Highly potent synthetic glucocorticoid that suppresses acute and chronic inflammation; potentiates vascular smooth muscle relaxation by beta-adrenergic agonist.
<b>Indications:</b>	Anaphylaxis, bronchodilator for unresponsive asthma.
<b>Contraindications:</b>	Untreated serious infections, documented hypersensitivity, IM route is contraindicated in idiopathic thrombocytopenic purpura, traumatic brain injury (high doses)
<b>Side Effects:</b>	Depression, euphoria, headache, restlessness, seizure, increased ICP, pulmonary tuberculosis, hypertension, heart failure, nausea, vomiting, peptic ulcer, fluid retention, hypernatremia, hyperkalemia
<b>Adult Dose/Protocols:</b>	<u>Allergic Reaction / Anaphylaxis; Bronchospasm / Asthma / COPD</u> <b>125 mg IV/IM.</b>
<b>Pediatric Dose/Protocols:</b>	<u>Allergic Reaction / Anaphylaxis; Respiratory Distress-Lower Airway</u> <b>2 mg/kg IV/IM (Maximum dose 125 mg).</b>

# MIDAZOLAM (Versed®)

<b>Class:</b>	Anticonvulsants, other; antianxiety agent; anxiolytics; benzodiazepines
<b>Mechanism of Action:</b>	Binds receptors at several sites within the CNS, including the limbic system and reticular formation; effects may be mediated through gamma-aminobutyric acid (GABA) receptor system; increase in neuronal membrane permeability to chloride ions enhances the inhibitory effects of GABA; the shift in chloride ions causes hyperpolarization (less excitability) and stabilization of the neuronal membrane.
<b>Indications:</b>	For the management of seizures, uncontrolled shivering in hypothermia, and for the management of agitated or violent patients suffering behavioral emergencies.
<b>Contraindications:</b>	Documented hypersensitivity, severe respiratory depression, sleep apnea
<b>Side Effects:</b>	Headache, somnolence, respiratory depression, respiratory arrest, apnea, hypotension, cardiac arrest, nausea, vomiting,
<b>Adult Dose/Protocols:</b>	<p><u>Agitated or Violent Patient/Behavioral Emergencies</u></p> <p><b>IV/IM/IN: 5 mg</b>; May repeat after max onset up to a maximum total dose of 10 mg.</p> <p><i>Onset IV: 3-5 min; IM: 10-15 min; IN: 3-5 min</i></p> <p><u>Bradycardia; Tachycardia-Narrow Complex (Regular); Tachycardia-Narrow Complex (Irregular); Tachycardia-Wide Complex</u></p> <p><b>2 mg IV/IO</b></p> <p><u>Medication Assisted Intubation; ROSC-Targeted Temp Mgmt</u></p> <p><i>Intubation: 0.1 mg/kg IV/IO (maximum 10 mg)</i></p> <p><i>Post-Intubation / ROSC TTM Sedation: 0.05 mg/kg IV/IO every 3-5 minutes as needed (total max10mg)</i></p> <p><u>Seizure</u></p> <p><b>IV/IO: 0.1 mg/kg IV</b> over 2 minutes (maximum dose 5 mg); may repeat x 1 after 5 minutes if seizure persists.</p> <p><b>IM: 0.2 mg/kg IM</b> (maximum dose 10 mg)</p> <p><b>IN: 0.2 mg/kg IN</b> (maximum dose 10 mg; max 1 ml per nostril) (<b>Must use 10mg/2ml concentration</b>)</p>

Medication Continues

# MIDAZOLAM (Versed®)

## **Pediatric Dose/ Protocols:**

### Agitated or Violent Patient/Behavioral Emergencies

**IV/IM/IN: 0.1 mg/kg;** (maximum dose 5 mg)

*Onset: IV: 3-5 min; IM: 10-15 min; IN: 3-5 min*

Bradycardia; Tachycardia-Narrow Complex; Tachycardia-Wide Complex

**0.1 mg/kg IV/IO/IN** (maximum dose 2mg).

### Seizure

**IV/IO: 0.1 mg/kg IV** (maximum dose 5 mg);

**IM/IN: 0.2 mg/kg IM** (maximum dose 5 mg; max 1 ml per nostril)

# MORPHINE SULFATE

<b>Class:</b>	Opioid analgesic; schedule II drug
<b>Mechanism of Action:</b>	Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; produces analgesia, respiratory depression, and sedation; suppresses cough by acting centrally in medulla.
<b>Indications:</b>	Management of acute pain.
<b>Contraindications:</b>	Head injury, exacerbated COPD, depressed respiratory drive, hypotension, undiagnosed abdominal pain, decreased level of consciousness, suspected hypovolemia, patients who have taken MAOI's within 14 days
<b>Side Effects:</b>	Confusion, sedation, headache, CNS depression, respiratory depression, apnea, bronchospasm, dyspnea, hypotension, orthostatic hypotension, syncope, bradycardia, tachycardia, nausea, vomiting, dry mouth
<b>Adult Dose/Protocol:</b>	<p><u>Chest Pain / Acute Coronary Syndrome / STEMI</u></p> <p><b>2 mg slow IV/IO</b> over 1 minute</p> <p><u>Pain Management</u></p> <p><b>5 mg slow IV/IO</b> or <b>10 mg IM</b>. May repeat IV/IO dose x 1 after 15 minutes if needed.</p>
<b>Pediatric Dose/Protocol:</b>	<p><u>Pain Management</u></p> <p><b>0.1 mg/kg IV/IO/IM</b> (max 10mg). May repeat IV/IO dose x 1 after 15 minutes if needed.</p>

# NALOXONE (Narcan®, EVZIO®)

<b>Class:</b>	Opioid reversal agent
<b>Mechanism of Action:</b>	Competitive inhibition at narcotic receptor sites. Reverses respiratory depression secondary to opiate drugs. Completely inhibits the effect of morphine.
<b>Indications:</b>	Opiate overdose, complete or partial reversal of CNS and respiratory depression induced by opioids, decreased level of consciousness, coma of unknown origin.
<b>Contraindications:</b>	Hypersensitivity . Use with caution in narcotic-dependent patients and neonates of narcotic- addicted mothers.
<b>Side Effects:</b>	Restlessness, seizures, dyspnea, pulmonary edema, tachycardia, hypertension, dysrhythmias, cardiac arrest, nausea, vomiting, withdrawal symptoms in opioid-addicted patients, diaphoresis
<b>Adult Dose/Protocols:</b>	<p><u>Poisoning and Overdose</u></p> <p><b>IV or IM – 0.4 mg;</b> may repeat every 2-3 minutes to a maximum dose of 4 mg if no response.</p> <p><b>IN – 1 mg/mL per nostril via atomizer</b> (1 mL per nostril maximum; 2 mg total dose). May repeat in 2-3 minutes to a maximum dose of 4 mg if no response.</p>
<b>Pediatric Dose/Protocols:</b>	<p><u>Poisoning and Overdose</u></p> <p><b>0.1 mg/kg via atomizer</b> (1 mL per nostril maximum). May repeat in 2-3 minutes to a maximum dose of 2 mg if no response.</p> <p>a. Infant / Toddler (age 1-3): <b>0.5 mg (0.5 mL) per nostril</b> for a total dose of 1 mg.</p> <p>b. Small Child and Larger (age &gt; 3): <b>1 mg (1 mL) per nostril</b> for a total dose of 2 mg.</p>

# NITROGLYCERIN (Nitrostat®)

<b>Class:</b>	Vasodilator
<b>Mechanism of Action:</b>	Smooth muscle relaxant acting on vasculature, bronchial, uterine, intestinal smooth muscle. Dilation of arterioles and veins in the periphery. Reduces preload and afterload, decreasing workload of the heart and thereby myocardial oxygen demand.
<b>Indications:</b>	Acute angina pectoris, ischemic chest pain, hypertension, heart failure, pulmonary edema.
<b>Contraindications:</b>	Hypotension, hypovolemia, intracranial bleeding or head injury, pericardial tamponade, severe bradycardia or tachycardia, RV infarction, recent use of erectile dysfunction medications (sildenafil (Viagra® – within last 24 hours), tadalafil (Cialis® – within last 48 hours), vardenafil (Levitra® – within last 48 hours).
<b>Side Effects:</b>	Headache, dizziness, weakness, reflex tachycardia, syncope, hypotension, nausea, vomiting, dry mouth, muscle twitching, diaphoresis
<b>Adult Dose/Protocols:</b>	<u>Chest Pain / Acute Coronary Syndrome / STEMI; CHF / Pulmonary Edema</u>  0.4 mg SL; may repeat every 3-5 minutes to maximum of 3 doses as long as chest pain persists and SBP > 90 mmHg.
<b>Pediatric Dose/Protocols:</b>	None

# NOREPINEPHRINE (Levophed®)

<b>Class:</b>	Sympathomimetic, vasopressor
<b>Mechanism of Action:</b>	Strong beta-1 and alpha-adrenergic effects and moderate beta-2 effects, which increase cardiac output and heart rate, decrease renal perfusion and peripheral vascular resistance, and cause variable BP effects.
<b>Indications:</b>	Cardiogenic shock unresponsive to fluid resuscitation, significant hypotensive (<70 mm Hg) states, first-line vasopressor in septic shock; IV Pump available.
<b>Contraindications:</b>	Hypersensitivity, hypotension due to blood volume deficit, peripheral vascular thrombosis (except for lifesaving procedures); No IV Pump
<b>Side Effects:</b>	Headache, anxiety, dizziness, restlessness, dyspnea, bradycardia, hypertension, dysrhythmias, chest pain, peripheral cyanosis, cardiac arrest, nausea, vomiting, urinary retention, renal failure, decreased blood flow to the GI tract, kidneys, skeletal muscle, and skin, tissue necrosis from extravasation
<b>Adult Dose/Protocol:</b>	<u>Bradycardia</u> ; <u>CHF / Pulmonary Edema</u> ; <u>ROSC</u> ; <u>Sepsis</u> ; <u>Shock</u> <b>2-30 mcg/min</b>
<b>Pediatric Dose/Protocol:</b>	None

**Mixing Instructions:** Mix 8mg in 250 mL D5W = 32 mcg/mL



# ONDANSETRON (Zofran®, Zofran ODT®)

<b>Class:</b>	Serotonin receptor antagonist, antiemetic
<b>Mechanism of Action:</b>	Blocks action of serotonin, a natural substance that causes nausea and vomiting.
<b>Indications:</b>	Prevention and control of nausea and vomiting.
<b>Contraindications:</b>	Hypersensitivity to ondansetron or other 5-HT <sub>3</sub> receptor antagonists.
<b>Side Effects:</b>	Headache, malaise, wheezing, bronchospasm, AF, abnormal ECG, prolonged QT interval, ST segment depression, second-degree AV block, constipation, diarrhea, hives, skin rash
<b>Adult Dose/Protocol:</b>	<u>Nausea / Vomiting</u> <b>4 mg PO</b> ; may repeat x1 after 15 minutes (max total dose 8 mg).
<b>Pediatric Dose/Protocol:</b>	<u>Nausea / Vomiting</u> > 6 months old: <b>0.15 mg/kg IV/IM</b> > 4 years old: <b>4 mg PO</b> Maximum total dose: 4 mg

# ORAL GLUCOSE (Insta-Glucose®)

<b>Class:</b>	Hyperglycemic, carbohydrate
<b>Mechanism of Action:</b>	After absorption in the GI tract, glucose is distributed to the tissues providing an increase in circulating blood glucose levels.
<b>Indications:</b>	Conscious patients with suspected hypoglycemia.
<b>Contraindications:</b>	Decreased level of consciousness, nausea, vomiting.
<b>Side Effects:</b>	Nausea, vomiting
<b>Adult Dose/Protocols:</b>	<u>Altered Mental Status; Diabetic Emergencies</u> 15 grams PO
<b>Pediatric Dose/Protocols:</b>	<u>Altered Mental Status; Diabetic Emergencies</u> 15 grams PO

# SODIUM BICARBONATE

<b>Class:</b>	Systemic hydrogen ion buffer, alkalizing agent
<b>Mechanism of Action:</b>	Increases blood and urinary pH by releasing a bicarbonate ion, which in turn neutralizes hydrogen ion concentrations.
<b>Indications:</b>	Metabolic acidosis during cardiac arrest, tricyclic antidepressant, aspirin and phenobarbital overdose, hyperkalemia, crush injuries.
<b>Contraindications:</b>	Documented hypersensitivity, severe pulmonary edema, known alkalosis, hypernatremia, or hypocalcemia.
<b>Side Effects:</b>	Hypernatremia, metabolic alkalosis, tissue sloughing, cellulitis, necrosis at injection site, seizures, fluid retention, hypokalemia, electrolyte imbalance, tetany, sodium retention, peripheral edema
<b>Adult Dose/Protocols:</b>	<p><u>Cardiac Arrest-(Asystole / PEA)</u>  <b>50 mEq IV/IO</b></p> <p><u>Crush Injuries</u>  <b>50 mEq in 1000 mL of 0.9% Normal Saline</b></p> <p><u>Poisoning and Overdose (Tricyclic Antidepressants)</u>  <b>1 mEq/kg IV</b></p>
<b>Pediatric Dose/ Protocols:</b>	<p><u>Crush Injuries</u>  <b>1 mEq/kg (max 50 mEq)</b></p> <p><u>Poisoning and Overdose</u>  <b>1 mEq/kg IV</b></p>

# TRANEXAMIC ACID (Lysteda®)

<b>Class:</b>	Hemostatic agent, antifibrinolytic, plasminogen inactivator
<b>Mechanism of Action:</b>	Reduces plasminogen activation, mitigating conversion to plasmin.
<b>Indications:</b>	Blunt or penetrating trauma less than 3 hours from onset with hemodynamic compromise, bleeding.
<b>Contraindications:</b>	Hypersensitivity; MOI greater than 3 hours; subarachnoid hemorrhage; history of PE, DVT, or other thromboembolic disorder
<b>Side Effects:</b>	Fatigue, headache, abdominal pain, anemia, DVT, PE, other thromboembolic disorder. Rapid infusion may cause hypotension
<b>Adult Dose/Protocols:</b>	<p><u>Obstetric and Gynecological Conditions; Tranexamic Acid</u></p> <p><b>1 gram/10mL in 50mL NS</b> over 10 minutes IV via 10 drop tubing (1 drop per second).</p> <p>*According to the manufacturer, TXA should be given via a dedicated IV line.*</p>
<b>Pediatric Dose/Protocol:</b>	None

# **East Central Illinois EMS System**



## **Procedures**

***2020***

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# Blind Insertion Airway - i-gel®

## Clinical Indications:

- Inability to adequately ventilate a patient with a bag valve mask or longer EMS transport distances require a more advanced airway
- Inability to secure an endotracheal tube in a patient who does not have a gag reflex
- Appropriate intubation is impossible due to patient access or difficult airway anatomy

## Procedure:

1. Pre-oxygenate the patient with 100% oxygen if time permits.
2. Select the appropriate tube size for the patient.
3. Remove the device from the protective cradle and inspect for any signs of damage.
4. Place water-soluble lubricant in the middle of the protective cradle.
5. Lubricate the back, sides and front of the i-gel with a thin layer of lubricant.
6. Grasp along the integral bite block and face the cuff outlet toward the patient's chin.
7. Insert the i-gel into the mouth in the direction towards the hard palate.
8. Glide the device down and back along the hard palate with continuous but gentle pressure, until resistance is met.
9. The tip of the airway should be located in the upper esophageal opening and the cuff should be located against the laryngeal framework. The incisors should be resting on the integral bite block.
10. Tape to secure or use a commercial tube holder.
11. Connect the i-gel to a BVM and assess for breath sounds and air entry.
12. Confirm tube placement (i.e. EtCO<sub>2</sub>, chest rise, breath sounds, absent epigastric sounds)
13. Continue to monitor airway with continuous waveform capnography and pulse oximetry.
14. Reassess i-gel placement after every move and upon arrival in the ED.

i-gel Size	Patient Size	Patient weight guidance (kg)
1	Neonate	2-5 kg
1.5	Infant	5-12 kg
2	Small Pediatric	10-25 kg
2.5	Large Pediatric	25-35 kg
3	Small Adult	30-60 kg
4	Medium Adult	50-90 kg
5	Large Adult +	90+ kg



# Blind Insertion Airway - i-gel®

## The i-gel® supraglottic airway

### Preparations for use

#### Adult sizes



Open the i-gel package, and on a flat surface take out the protective cradle containing the device.



Remove the i-gel and transfer it to the palm of the same hand that is holding the protective cradle, supporting the device between the thumb and index finger.



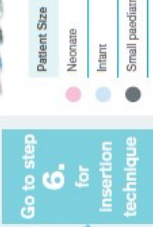
Place a small bolus of a water-based lubricant, such as K-Y Jelly®, onto the middle of the smooth surface of the protective cradle in preparation for lubrication.



Grasp the i-gel with the opposite (free) hand along the integral bite block and lubricate the back, sides and front of the cuff with a thin layer of lubricant.



Inspect the device carefully, confirm there are no foreign bodies or a BOLUS of lubricant obstructing the distal opening. Place the i-gel back into the protective cradle in preparation for insertion.



Go to step 6. for insertion technique

#### Paediatric sizes



Open the i-gel package, and on a flat surface take out the cage pack containing the device.



Open the cage pack and transfer the i-gel into the lid of the cage.



Place a small bolus of a water-based lubricant, such as K-Y Jelly®, onto the middle of the smooth surface of the cage pack ready for use.



Grasp the i-gel along the integral bite block and lubricate the back, sides and front of the cuff with a thin layer of lubricant.



Inspect the device carefully, confirm there are no foreign bodies or a BOLUS of lubricant obstructing the distal opening. Place the i-gel back into the cage pack in preparation for insertion.

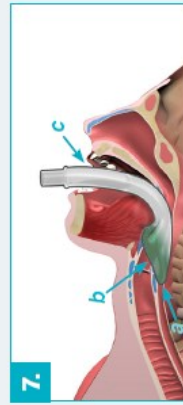


Go to step 6. for insertion technique

### Insertion technique



Remove the i-gel from the protective cradle or cage pack. Grasp the lubricated i-gel firmly along the integral bite block. Position the device so that the i-gel cuff outlet is facing towards the chin of the patient. The patient should be in the 'sniffing the morning air' position with head extended and neck flexed. The chin should be gently pressed down before proceeding. Introduce the leading soft tip into the mouth of the patient in a direction towards the hard palate.



Slide the device downwards and backwards along the hard palate with a continuous but gentle push until a definitive resistance is felt. The tip of the airway should be located into the upper oesophageal opening (a) and the cuff should be located against the laryngeal framework (b). The incisors should be resting on the integral bite block (c).



The i-gel should be taped down from 'mantilla to maxilla'.



Patient Size	Weight
Neonate	1 2-5kg
Infant	1.5 5-12kg
Small paediatric	2 10-20kg
Large paediatric	2.5 20-30kg
Small adult	3 30-60kg
Medium adult	4 60-90kg
Large adult	5 90+kg



### Important notes to the recommended insertion technique

Sometimes a feel of 'give-way' is felt before the end point resistance is met. This is due to the passage of the bowl of the i-gel through the faucial pillars. It is important to continue to insert the device until a definitive resistance is felt.

Once definitive resistance is met, and the teeth are located on the integral bite block, do not repeatedly push the i-gel down or apply excessive force during insertion.

It is not necessary to insert fingers or thumbs into the patient's mouth during the process of inserting the device.

Visit the i-gel website [www.i-gel.com](http://www.i-gel.com)

Intersurgical Ltd, Crane House, Mill Mill Lane, Wokingham, Berkshire, RG4 2BZ, UK  
T: +44 (0)118 9056 500 F: +44 (0)118 9056 206  
[www.intersurgical.com](http://www.intersurgical.com)



This poster does NOT constitute a comprehensive guide to the preparation, insertion and use of the i-gel. The user should first familiarise themselves with the Instructions for Use supplied with the product before attempting to use the i-gel. Additionally, a User Guide is available by contacting Intersurgical or by visiting our website [www.i-gel.com](http://www.i-gel.com). The i-gel must always be separated from the protective cradle or cage pack prior to insertion. The cradle is not an introducer and must never be inserted into the patient's mouth. i-gel is a registered trademark of Johnson and Johnson Inc.

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# Blind Insertion Airway - King Airway

## Clinical Indications:

- Inability to adequately ventilate a patient with a bag valve mask or longer EMS transport distances require a more advanced airway
- Inability to secure an endotracheal tube in a patient who does not have a gag reflex
- Appropriate intubation is impossible due to patient access or difficult airway anatomy

## Contraindications:

- Responsive patients with an intact gag reflex
- Patients with known esophageal disease
- Patients who have ingested caustic substances

## Procedure:

1. Pre-oxygenate the patient with 100% oxygen if time permits.
2. Select the appropriate tube size for the patient.
3. Apply a water-based lubricant to the beveled distal tip and posterior aspect of the tube.
4. Hold the King Airway Device at the connector with your dominant hand. With your non-dominant hand, hold the patient's mouth open and apply chin lift unless contraindicated by c-spine precautions.
5. Gently insert the tube rotated laterally 45-90 degrees so that the blue orientation line is touching the corner of the mouth. Once the tip is at the base of the tongue, rotate the tube back to midline.
6. Insert the airway until the base of the connector is in line with the teeth and gums.
7. Inflate the pilot balloon with air depending on the size of the device used.
8. Ventilate the patient while gently withdrawing the airway until the patient is easily ventilated.
9. Confirm tube placement (i.e. EtCO<sub>2</sub>, chest rise, breath sounds, absent epigastric sounds)
10. Secure tube using tape or commercial device.
11. Reassess placement after every move and upon arrival in the ED.

Size	Patient Criteria	Cuff Volume (mL)
2	35-45 inches or 12-25 kg	25 - 35
2.5	41-51 inches or 25-35 kg	30 - 40
3	4-5 Feet	40 - 55
4	5-6 Feet	50 - 70
5	Greater than 6 Feet	60 - 80

# Continuous Positive Airway Pressure (CPAP)

## Clinical Indications:

- The suspected CHF, COPD, asthma or pneumonia patient
- To ease significant labored respirations and the work of breathing in patients on supplemental oxygen who may otherwise require intubation
- Exhibiting hypoxemia ( $O_2$  saturation  $<94\%$  at any time) not resolved by supplemental oxygen therapy
- Patient currently on BiPap / CPAP at referring facility with satisfactory improvement in oxygenation and ventilation
- Must have SBP  $\geq 90$  mmHg

## Contraindications:

- Cardiac or respiratory arrest / apnea
- Unable to follow commands
- Unable to maintain their own airway
- Agitated or combative behavior and unable to tolerate mask
- Vomiting and/or active GI bleed
- Respiratory distress secondary to trauma
- Suspicion of pneumothorax
- Facial trauma or impossible face seal
- Hypotension with SBP  $<90$  mmHg

## Procedure:

1. Ensure all necessary equipment is available and assembled (follow manufacturer's directions for preparation of your particular device).
2. Choose appropriate sized device mask for patient.
3. Explain the procedure to the patient. Be prepared to coach the patient for claustrophobia or anxiety.
4. Ensure oxygen is flowing prior to placing CPAP mask on patient's face.
5. Place mask on patient's face using bridge of nose as a guide. Secure cap around patient's head and tighten Velcro straps on each side. Adjust extender on forehead to fit tightly on patient's face.
6. Apply CPAP at recommended  $H_2O$  pressure, 5-10 cm  $H_2O$ , or continue current  $H_2O$  pressure if CPAP already in use. Start with 5 cm PEEP.
7. Recheck mask for leaks and adjust straps as needed to minimize air leaks.
8. Monitor vital signs and symptoms, pulse oximetry and waveform capnography.
9. If patient condition is deteriorating (decreasing LOC, decreasing  $O_2$  sat, or any exclusion criteria become evident), remove CPAP and assist respirations with BVM ventilations.



# Cricothyrotomy - Pertrach®

## Clinical Indications:

- >12 years of age
- In need of airway control as a life-saving measure, and control cannot be attained despite 3 attempts using more conventional methods
  - These methods may include securing airway by means such as oropharyngeal airway and BVM device, a blind insertion airway device or intubation by direct visualization

## Procedure:

1. Identify the landmarks of the neck and identify the cricothyroid membrane.
2. Prepare the anterior neck by cleansing with antiseptic cleansing solution.
3. Remove dilator from the package and protective sheath and advance it into the tracheostomy tube.
4. With the non-dominant hand, stabilize the skin over the cricothyroid membrane.
5. Using the scalpel, make a 1-2 cm vertical incision through the skin over the cricothyroid membrane (optional but may make insertion of dilator and tube easier).
6. Attach break-away needle to 10 cc syringe. Insert needle perpendicular through incision, through cricothyroid membrane and into lumen of the trachea. While advancing the splitting needle, lightly pull back on the plunger of the syringe. When air bubbles occur or you feel a break in resistance, stop advancing the needle.
7. Stabilize needle with your hand and remove syringe.
8. Insert tip of dilator into the hub of splitting needle. Squeeze wings of needle together to split the needle. Remove both halves of the needle, leaving dilator in trachea.
9. Using firm but gentle pressure, insert dilator and tracheostomy tube into position until flange is against the skin.
10. Remove dilator.
11. Inflate cuff until you have control of the airway.
12. Attach BVM to cannula and ventilate patient with 100% oxygen.
13. Confirm lung sounds in the usual manner.
14. Attach cannula to neck using cloth umbilical tape.



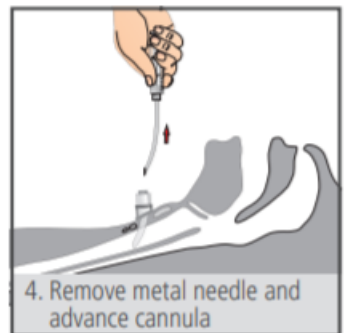
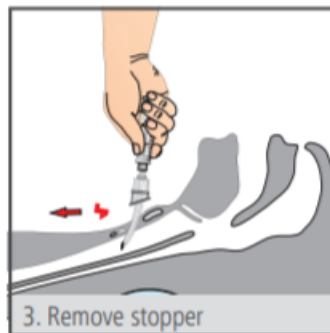
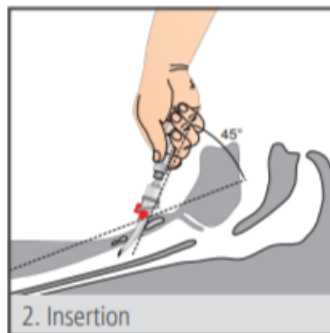
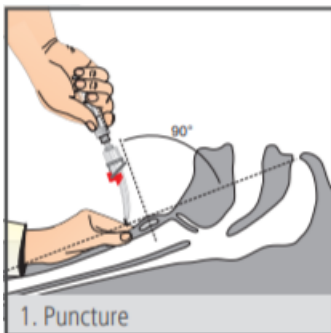
# Cricothyrotomy - QuickTrach®

## Clinical Indications:

- >12 years of age
- In need of airway control as a life-saving measure, and control cannot be attained despite 3 attempts using more conventional methods
  - These methods may include securing airway by means such as oropharyngeal airway and BVM device, a blind insertion airway device or intubation by direct visualization

## Procedure:

1. Identify the landmarks of the neck and identify the cricothyroid membrane.
2. Prepare the anterior neck by cleansing with antiseptic cleansing solution.
3. With the non-dominant hand, stabilize the skin over the cricothyroid membrane.
4. Using the syringe and the finder needle supplied in the QuickTrach kit, insert the needle through the cricothyroid membrane at a 90-degree angle caudally (toward the feet).
5. Confirm entry of needle in trachea by aspirating air and/or bubbles through the syringe.
6. If air and/or bubbles present, change the angle of insertion to 45-degrees.
7. Advance the device to the level of the stop guide.
8. Remove the stop guide and slide the plastic cannula along the needle into the trachea until the flange rests against the neck.
9. Carefully remove the needle and syringe.
10. Secure the cannula with the provided anchoring device.
11. Attach the connecting tube to the 15mm connection.
12. Attach BVM to connection tube and ventilate patient with 100% oxygen.
13. Confirm lung sounds in the usual manner.
14. Attach cannula to neck using cloth umbilical tape.





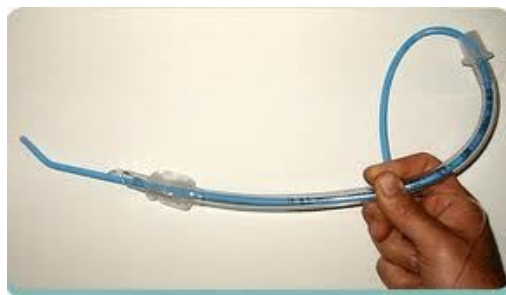
# Endotracheal Tube Introducer: Bougie

## Clinical Indications:

- Patients meet clinical indications for oral intubation
- Initial intubation attempt(s) unsuccessful
- Predicted difficult intubation

## Procedure:

1. Prepare, position and oxygenate the patient with 100% oxygen.
2. Select proper ETT without stylet, test cuff and prepare suction.
3. Lubricate the tip of the Bougie with a water-soluble lubricant.
4. Using laryngoscopic techniques, visualize the vocal cords if possible using Sellick / BURP as needed.
5. Introduce the Bougie with curved tip anteriorly and visualize the tip passing the vocal cords or above the arytenoids if the cords cannot be visualized.
6. Once inserted, gently advance the Bougie until you meet resistance or “hold-up” (if you do not meet resistance you have a probable esophageal intubation and insertion should be reattempted or the failed airway protocol implemented as indicated).
7. Withdraw the Bougie ONLY to a depth sufficient to allow loading of the ETT while maintaining proximal control of the Bougie.
8. Gently advance the Bougie and loaded ETT until you have “hold-up” again, thereby assuring tracheal placement and minimizing the risk of accidental displacement of the Bougie.
9. While maintaining a firm grasp on the proximal Bougie, introduce the ETT over the Bougie passing the tube to its appropriate depth.
10. Once the ETT is correctly placed, hold the ETT securely and remove the Bougie.
11. Inflate the cuff with 3 - 10 mL of air.
12. Confirm appropriate placement with waveform capnography, symmetrical chest-wall rise, auscultation of equal breath sounds over the chest and a lack of epigastric sounds with ventilations using a BVM.
13. Secure the tube using commercial device.
14. Document ETT size, time, result (success), and placement location by the centimeter marks either at the patient’s teeth or lips. Document all devices used to confirm initial tube placement. Also document positive or negative breath sounds before and after each movement of the patient.
15. Continuously monitor EtCO<sub>2</sub> to detect tube dislodgement or obstruction. Reconfirm correct placement after each patient movement.



# Needle Chest Decompression

## Clinical Indications:

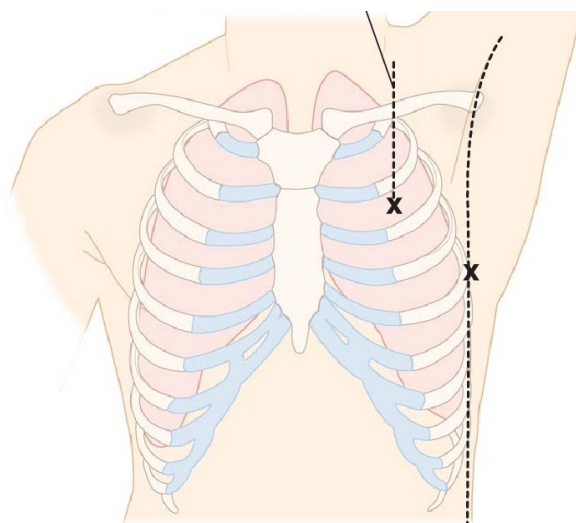
Patients with hypotension (SBP <90), clinical signs of shock, and at least one of the following signs:

- Jugular vein distention
- Tracheal deviation away from the side of the injury (often a late sign)
- Absent or diminished breath sounds on the affected side
- Hyper-resonance to percussion on the affected side
- Increased resistance when ventilating the patient

Patients in traumatic arrest with chest or abdominal trauma for whom resuscitation is indicated. These patients may require bilateral chest decompression even in the absence of the signs above.

## Procedure:

1. Administer high flow oxygen.
2. Identify the site:
  - Locate the second intercostal space in the mid-clavicular line on the same side as the pneumothorax
  - If unable to place anteriorly, lateral placement may be used at the fourth intercostal space in the mid-axillary line
3. Prepare the site by cleansing with antiseptic cleansing solution.
4. Insert the appropriate catheter into the skin perpendicular to the chest wall over the appropriate rib and direct it just over the top of the rib (superior border) into the intercostal space.
5. Advance the needle-catheter through the parietal pleura until a “pop” is felt and air or blood exits under pressure through the catheter, then advance the catheter only to chest wall.
6. Remove the needle, leaving the plastic catheter in place.
7. Secure the catheter hub to the chest wall using a commercial seal with a one-way valve or create a flutter valve from the finger of an exam glove.



# Orotracheal Intubation

## Clinical Indications:

- Inability to adequately ventilate a patient with a bag valve mask or longer EMS transport distances require a more advanced airway
- An unconscious patient without a gag reflex who is apneic or is demonstrating inadequate respiratory effort

## Procedure:

1. Prepare, position and oxygenate the patient with 100% oxygen.
2. Have suction and bougie ready.
3. Assess for airway difficulty and have back up plan and equipment ready.
4. Select proper ETT size. Assure that cuff is functioning.
5. Open the patient's airway and holding the laryngoscope in the left hand, insert the blade into the right side of the mouth and sweep the tongue to the left.
6. Use the blade to lift the tongue and epiglottis (either directly with the straight blade or indirectly with the curved blade).
7. Using laryngoscope, visualize vocal cords. (Use Sellick maneuver / BURP to assist you). If using video laryngoscope, follow manufacturer guidelines for use.
8. Once the glottis opening is visualized, pass the tube through the vocal cords and continue to visualize until the cuff is past the cords.
9. Limit each intubation attempt to 30 seconds with BVM ventilations between attempts.
10. Remove the laryngoscope and then the stylet from the ETT.
11. Inflate the cuff with 3 - 10 mL of air.
12. Confirm appropriate placement with waveform capnography, symmetrical chest-wall rise, auscultation of equal breath sounds over the chest and a lack of epigastric sounds with ventilations using a BVM.
13. Secure the tube using commercial device.
14. Document ETT size, time, result (success), and placement location by the centimeter marks either at the patient's teeth or lips. Document all devices used to confirm initial tube placement. Also document positive or negative breath sounds before and after each movement of the patient.
15. Continuously monitor EtCO<sub>2</sub> to detect tube dislodgement or obstruction. Reconfirm correct placement after each patient movement.



# Ventilator Management

## Clinical Indications:

- Management of the ventilation of a patient during a prolonged or interfacility transport of an intubated patient

## Procedure:

1. Transporting personnel should review the operation of the ventilator with the treating personnel (physician, nurse, or respiratory therapy) in the referring facility prior to transport if possible.
2. All ventilator settings, including respiratory rate, FiO<sub>2</sub>, mode of ventilation, and tidal volumes should be recorded prior to initiating transport. Additionally, the recent trends in oxygen saturation experienced by the patient should be noted.
3. Prior to transport, specific orders regarding any anticipated changes to ventilator settings as well as causes for significant alarm should be reviewed with the referring medical personnel as well as medical control.
4. Once in the transporting unit, confirm adequate oxygen delivery to the ventilator.
5. Frequently assess breath sounds to assess for possible tube dislodgment during transfer.
6. Frequently assess the patient's respiratory status, noting any decreases in oxygen saturation or changes in tidal volumes, peak pressures, etc.
7. It is strongly recommended that the airway be monitored continuously through capnography and pulse oximetry.
8. If any significant change in patient condition, including vital signs or oxygen saturation or there is a concern regarding ventilator performance / alarms, remove the ventilator from the endotracheal tube and use a BVM with 100% oxygen. Contact medical control immediately.

# Waveform Capnography

## Clinical Indications:

- Shall be used with the use of all invasive airway procedures including endotracheal, cricothyrotomy, or Blind Insertion Airway Devices (i-gel & King airway)
- Should also be used on all respiratory patients, including asthma, COPD and CHF with use of CPAP
- Should be used on all cardiac arrests

## Procedure:

Tube Capnography Sensor: Attach capnography sensor to the BIAD, endotracheal tube, or oxygen delivery device.

Nasal Cannula Capnography Sensor: Place nasal prongs into patient's nose, plug sensor into monitor. Attach supplemental oxygen if needed.

1. Turn on monitor and verify EtCO<sub>2</sub> display is on and functioning.
2. Connect EtCO<sub>2</sub> tubing to monitor.
3. Note CO<sub>2</sub> level and waveform changes. These will be documented on each respiratory failure, cardiac arrest, or respiratory distress patient. Normal range is 35-45 mmHg.
4. Waveform capnography shall remain in place with the airway and be monitored throughout the prehospital care and transport.
5. Any loss of CO<sub>2</sub> detection or waveform indicates an airway problem and should be immediately evaluated for loss of airway or circulatory compromise and should be documented.
6. In all patients with a pulse an EtCO<sub>2</sub> reading > 20 mmHg is expected.
7. During cardiac arrest, good compressions will show a value of >10 mmHg. A spike in EtCO<sub>2</sub> may indicate ROSC.

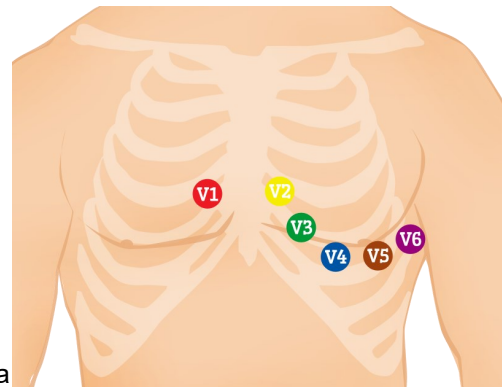
# 12-Lead ECG

## Clinical Indications:

- Suspected cardiac patient (CHF, pulmonary edema, dysrhythmias, palpitations)
- Suspected Acute Coronary Syndrome (chest, jaw, arm, epigastric discomfort, etc.)
- Suspected tricyclic overdose
- Electrical injuries
- Syncope
- Shortness of breath

## Procedure:

1. If patient is unstable, definitive treatment is the priority. If patient is stable or stabilized after treatment, perform a 12-lead ECG.
2. Prepare ECG monitor and connect patient cable with electrodes.
3. Enter the required patient information (patient name, etc.) into the 12-lead ECG device.
4. Expose chest and prep as necessary (i.e. hair removal). Modesty of the patient should be respected.
5. Apply chest leads and extremity leads using the following landmarks:
  - RA — Right arm
  - LA — Left arm
  - RL — Right leg
  - LL — Left leg
  - V1 — 4<sup>th</sup> intercostal space at right sternal border
  - V2 — 4<sup>th</sup> intercostal space at left sternal border
  - V3 — Directly between V2 and V4
  - V4 — 5<sup>th</sup> intercostal space at midclavicular line
  - V5 — Level with V4 at left anterior axillary line
  - V6 — Level with V5 at left midaxillary line
6. Instruct patient to remain still.
7. Press the appropriate button to acquire the 12-lead ECG.
8. If the monitor detects signal noise (such as patient motion or a disconnected electrode), the 12-lead acquisition will be interrupted until the noise is removed.
9. Once acquired, transmit the ECG data to the appropriate hospital.
10. Contact the receiving hospital to notify them that a 12-lead ECG has been sent and confirm they received the 12-lead.
11. Monitor the patient while continuing with the treatment protocol.



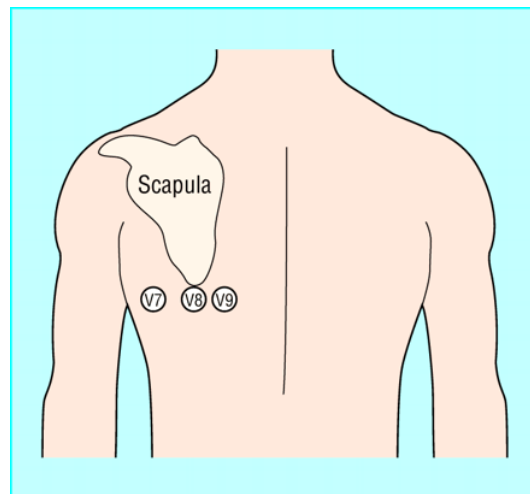
# Posterior ECG

## Clinical Indications:

- Suspected cardiac patient
- Reciprocal changes in leads V1-V3. Posterior MI is suggested by the following changes:
  - Horizontal ST depression
  - Tall, broad R waves (>30 ms)
  - Upright T waves
  - Dominant R wave (R/S ratio >1) in V2

## Procedure:

1. Acquire and transmit normal 12-lead ECG. Continue cardiac monitoring.
2. Locate V7 position:
  - Posterior 5th intercostal space
  - Left posterior axillary line
3. Move V4 lead to V7 position
4. Locate V8 position:
  - In line with V7 the posterior 5th intercostal space
  - Tip of the left scapula
5. Move V5 lead to V8 position.
6. Locate V9 position:
  - In line with V8 position
  - Left paraspinal border
7. Move V6 lead to V9 position
8. Instruct patient to remain still.
9. Press the appropriate button to acquire the 12-lead ECG.
10. If the monitor detects signal noise (such as patient motion or a disconnected electrode), the 12-lead acquisition will be interrupted until the noise is removed.
11. Once acquired, transmit the ECG data to the appropriate hospital.
12. Re-label the 3 altered leads on the ECG strip.



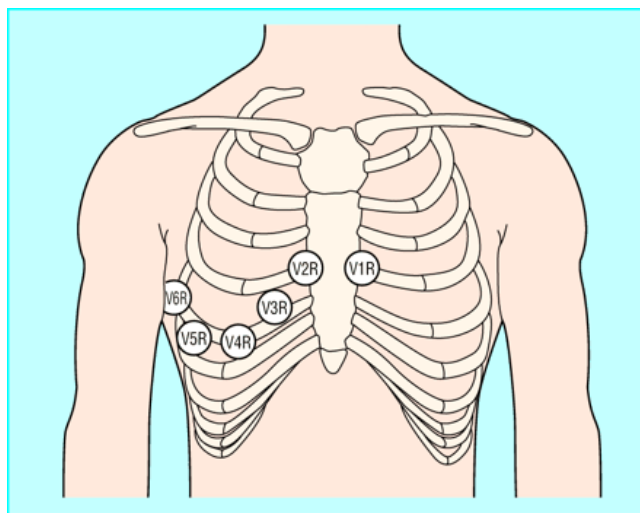
# Right-Sided ECG

## Clinical Indications:

- Suspected cardiac patient
- Inferior STEMI patients with ST elevation in V1 and ST elevation in lead III > lead II
  - Isoelectric ST segment in V1 with marked ST depression in V2

## Procedure:

1. Acquire and transmit normal 12 lead ECG. Continue cardiac monitoring.
2. Apply limb leads V1– V6 in mirror– image position on the right side of chest.
  - V1R-4th intercostal space at left sternal border (original V2 placement)
  - V2R -4th intercostal space at right sternal border (original V1 placement)
  - V3R -Directly between V2 and V4
  - V4R -5th intercostal space at midclavicular line
  - V5R -Level with V4 at left anterior axillary line
  - V6R -Level with V5 at left midaxillary line
3. Instruct patient to remain still.
4. Press the appropriate button to acquire the 12 lead ECG.
5. If the monitor detects signal noise (such as patient motion or a disconnected electrode), the 12-lead acquisition will be interrupted until the noise is removed.
6. Once acquired, transmit the ECG data to the appropriate hospital.
7. Re-label the 3 altered leads on the ECG strip.



# Synchronized Cardioversion

## Clinical Indications:

- Unstable patient with a tachydysrhythmia (rapid atrial fibrillation / flutter, supraventricular tachycardia, ventricular tachycardia)
- Patient is not pulseless (the pulseless patient requires unsynchronized cardioversion, i.e., defibrillation)

## Procedure:

1. Ensure the patient is attached properly to a monitor / defibrillator capable of synchronized cardioversion.
2. Have all equipment prepared for unsynchronized cardioversion / defibrillation if the patient fails synchronized cardioversion and the condition worsens and rhythm deteriorates into VF / pulseless VT.
3. Consider the use of pain or sedating medications.
4. Set monitor / defibrillator to synchronized cardioversion mode watching for R wave markers on each QRS complex.
5. Set energy selection to the appropriate setting per the appropriate protocol.
6. Make certain all personnel are clear of patient.
7. Press and hold the shock button to cardiovert. Stay clear of the patient until you are certain the energy has been delivered. NOTE: It may take the monitor / defibrillator several cardiac cycles to synchronize so there may a delay between activating the cardioversion and the actual delivery of energy.
8. Note patient response and perform immediate unsynchronized cardioversion / defibrillation if the patient's rhythm has deteriorated into pulseless VT / VF, following the procedure for Defibrillation-Manual.
9. Repeat until maximum setting or until efforts succeed. Consider discussion with medical control if cardioversion is unsuccessful after 2 attempts.

# Transcutaneous Pacing

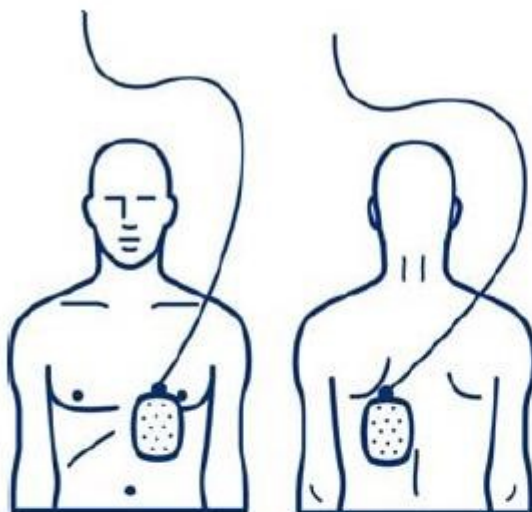
## Clinical Indications:

- Patients with symptomatic bradycardia (less than 60 per minute) with signs and symptoms of inadequate cerebral or cardiac perfusion such as:
  - Chest Pain
  - Hypotension
  - Pulmonary edema
  - Altered mental status, confusion, etc.
  - Ventricular ectopy

## Procedure:

1. Attach standard four-lead monitor.
2. Apply defibrillation / pacing pads to chest and back:
  - One pad to left mid chest next to sternum
  - One pad to mid left posterior chest next to spine.
3. Select pacing mode on the monitor.
4. Adjust heart rate to 70 BPM for an adult and 100 BPM for a child.
5. Note pacer spikes on ECG screen.
6. Slowly increase output until capture of electrical rhythm on the monitor.
7. If unable to capture while at maximum current output, stop pacing immediately.
8. If capture observed on monitor, check for corresponding pulse and assess vital signs.
9. Consider the use of sedation or analgesia if patient is uncomfortable.

## Anterior-Posterior Placement for Pacing (Standard)



# External Jugular Access

## Clinical Indications:

- External jugular vein cannulation is indicated in a critically ill patient  $\geq 8$  years of age who requires intravenous access for fluid or medication administration and in whom an extremity vein is not obtainable
- External jugular cannulation can be attempted initially in life threatening events where no obvious peripheral site is noted

## Procedure:

1. Place the patient in a supine head down position. This helps distend the neck vein and prevents air embolism
2. Turn the patient's head toward the opposite side if no risk of cervical injury exists.
3. Prep the site as per peripheral IV site.
4. Align the catheter with the vein and aim toward the same side shoulder.
5. "Tourniqueting" the vein lightly with one finger above the clavicle, puncture the vein midway between the angle of the jaw and the clavicle and cannulate the vein in the usual method.
6. Attach the IV lock and secure the catheter avoiding circumferential dressing or taping.



# Impedance Threshold Device - ResQPOD®

## Clinical Indications:

- Adult patients in cardiopulmonary arrest

## Procedure (Facemask):

1. Connect the ResQPOD to facemask.
2. Open airway. Establish and maintain tight face seal with mask throughout chest compressions; a head strap or 2-handed technique is recommended.
3. Connect ventilation source to top of ResQPOD, or mouthpiece if performing mouth to mask ventilation.
4. Perform CPR at recommended compression to ventilation ratio.
5. Place EtCO<sub>2</sub> detector between ResQPOD and ventilation source (preferred).



## Procedure (Advanced Airway):

1. Confirm ETT placement and secure with commercial tube holder.
2. Connect the ResQPOD to ETT or BIAD.
3. Connect ventilation source to the ResQPOD.
4. Perform continuous chest compression.
5. Turn on timing assist lights. Ventilate asynchronously at timing light flash rate of 10/min.
6. Place EtCO<sub>2</sub> detector between ResQPOD and ventilation source (preferred).



# Intraosseous Access - ARROW® EZ-IO®

## Clinical Indications:

- Rapid, regular IV access is unavailable with any of the following:
  - Cardiac arrest
  - Multisystem trauma with severe hypovolemia
  - Severe dehydration with vascular collapse and/or loss of consciousness
  - Respiratory failure / respiratory arrest
  - Burns

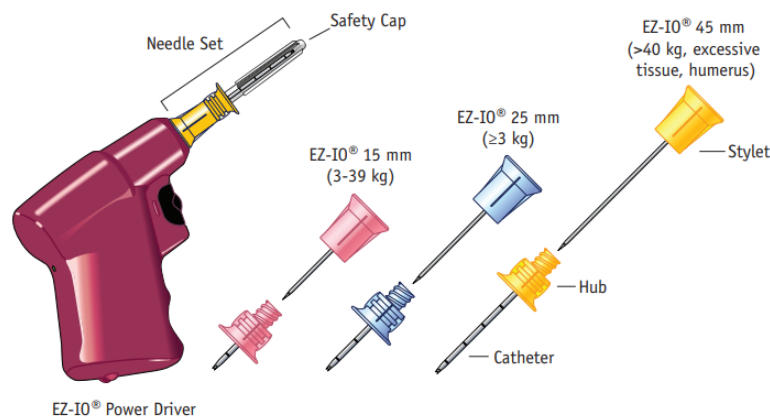
## Contraindications:

1. Fracture of the targeted bone
2. Previous, significant orthopedic procedures at insertion site (i.e. prosthetic limb or joint)
3. IO in the targeted bone within the past 48 hours
4. Infection at area of insertion
5. Excessive tissue or absence of adequate anatomical landmarks

## Needle Selection:

Select EZ-IO® Needle Set based on patient weight, anatomy and clinical judgment. The EZ-IO® Catheter is marked with a black line 5 mm proximal to the hub. Prior to drilling, with the EZ-IO® Needle Set inserted through the soft tissue and the needle tip touching bone, adequate needle length is determined by the ability to see the 5 mm black line above the skin.

1. EZ-IO® 45 mm Needle Set (yellow hub) should be considered for proximal humerus insertion in patients 40 kg and greater and patients with excessive tissue over any insertion site
2. EZ-IO® 25 mm Needle Set (blue hub) should be considered for patients 3 kg and greater
3. EZ-IO® 15 mm Needle Set (pink hub) should be considered for patients approximately 3-39 kg

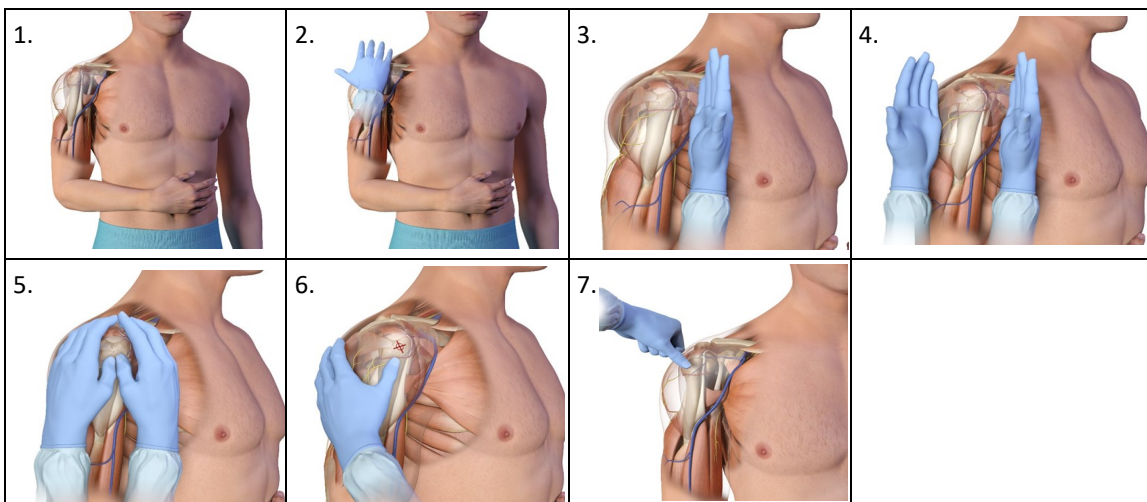


Procedure Continues

# Intraosseous Access - ARROW® EZ-IO®

## Proximal Humerus Identification:

1. Place the patient's hand over the abdomen (elbow adducted and humerus internally rotated).
2. Place your palm on the patient's shoulder anteriorly
  - The area that feels like a "ball" under your palm is the general target area
  - You should be able to feel this ball, even on obese patients, by pushing deeply
3. Place the ulnar aspect of one hand vertically over the axilla.
4. Place the ulnar aspect of the opposite hand along the midline of the upper arm laterally.
5. Place your thumbs together over the arm.
  - This identifies the vertical line of insertion on the proximal humerus.
6. Palpate deeply as you climb up the humerus to the surgical neck.
  - It will feel like a golf ball on a tee - the spot where the "ball" meets the "tee" is the surgical neck
7. The insertion site is on the most prominent aspect of the greater tubercle, 1 to 2 cm above the surgical neck.



## Proximal Tibia Identification:

### Adult:

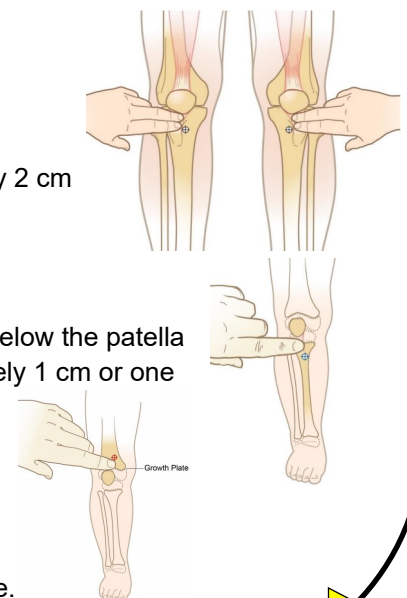
1. Extend the leg.
2. Insertion site is approximately 2 cm medial to the tibial tuberosity, or approximately 3 cm (two finger widths) below the patella and approximately 2 cm medial, along the flat aspect of the tibia.

### Infant / Child:

1. Extend the leg.
2. Insertion site is approximately 1 cm medial to the tibial tuberosity, or just below the patella (approximately 1 cm or one finger widths) and slightly medial (approximately 1 cm or one finger width), along the flat aspect of the tibia.

## Distal Femur (Infant/Child):

1. Secure the leg out-stretched to ensure the knee does not bend.
2. Identify the patella by palpation. The insertion site is just proximal to the patella (maximum 1 cm) and approximately 1-2 cm medial to midline.



Procedure Continues

# Intraosseous Access - ARROW® EZ-IO®

## Adult Insertion Technique:

1. Use a clean, “no touch” technique, maintaining asepsis.
2. Prepare supplies.
3. Prepare the site by using antiseptic of your choice; stabilize the extremity.
4. Remove the needle set cap.

### Proximal Humerus

1. Aim the needle set at a 45-degree angle to the anterior plane and posteromedial.
2. Push the needle set tip through the skin until the tip rests against the bone.

**The 5 mm mark must be visible above the skin for confirmation of adequate needle set length**

3. Gently drill into the humerus approximately 2 cm or until the hub is close to the skin; the hub of the needle set should be perpendicular to the skin.

### Tibia

1. Aim the needle set at a 90-degree angle to the bone.
2. Push the needle set tip through the skin until the tip rests against the bone.

**The 5 mm mark must be visible above the skin for confirmation of adequate needle set length**

3. Gently drill, advancing the needle set approximately 1-2 cm after entry into the medullary space or until the needle set hub is close to the skin.

## Infant/Child Insertion Technique:

1. Use a clean, “no touch” technique, maintaining asepsis.
2. Prepare supplies.
3. Prepare the site by using antiseptic of your choice; stabilize the extremity.
4. Remove the needle set cap.

### Proximal Humerus

1. Aim the needle set at a 45-degree angle to the anterior plane and posteromedial.
2. Push the needle set tip through the skin until the tip rests against the bone.

**The 5 mm mark must be visible above the skin for confirmation of adequate needle set length**

3. Gently drill into the humerus approximately 2 cm or until the hub is close to the skin; the hub of the needle set should be perpendicular to the skin.

### Tibia and Distal Femur

1. Aim the needle set at a 90-degree angle to the bone.
2. Push the needle set tip through the skin until the tip rests against the bone.

**The 5 mm mark must be visible above the skin for confirmation of adequate needle set length**

3. Gently drill, advancing the needle set approximately 1-2 cm after entry into the medullary space or until the needle set hub is close to the skin.

Procedure Continues 

# Intraosseous Access - ARROW® EZ-IO®

## **Insertion Completion:**

1. Hold the hub in place and pull the driver straight off; continue to hold the hub while twisting the stylet off the hub with counter clockwise rotations; catheter should feel firmly seated in the bone (1st confirmation of placement);
  - Dispose of all sharps and biohazard materials using standard biohazard practices and disposal containers.
  - If using the NeedleVISE® 1 port sharps block, place on stable surface and use a one-handed technique.
2. Place the EZ-Stabilizer® Dressing over the hub.
3. Attach a primed extension set to the catheter hub, firmly secure by twisting clockwise.
4. Pull the tabs off the dressing to expose the adhesive, apply to the skin.
5. Aspirate for blood / bone marrow (2nd confirmation of placement).\*  
*\*Inability to withdraw / aspirate blood from the catheter hub does not mean the insertion was unsuccessful.*
6. Proceed with technique below, based on situation:

### **Adult - Responsive to Pain:**

- a. Prime extension set with **2% LIDOCAINE**.  
*Note that the priming volume of the EZ-Connect® Extension Set is approximately 1 mL*
- b. Slowly infuse **2% LIDOCAINE 40 mg IO** over 120 seconds.
- c. Allow to dwell in IO space for 60 seconds.
- d. Flush with **5 to 10 mL** of **NORMAL SALINE**.

### **Adult - Unresponsive to Pain:**

- a. Prime extension set with **NORMAL SALINE**.  
*Note that the priming volume of the EZ-Connect® Extension Set is approximately 1 mL*
- b. Flush with **5 to 10 mL** of **NORMAL SALINE**

### **Infant/Child - Responsive to Pain:**

- a. Prime extension set with **2% LIDOCAINE**.
  - *Note that the priming volume of the EZ-Connect® Extension Set is approximately 1 mL*
  - *For small doses of lidocaine, consider administering by carefully attaching syringe directly to needle hub (prime extension set with normal saline)*
- b. Slowly infuse **2% LIDOCAINE 0.5 mg/kg mg IO** over 120 seconds (max 40 mg).
- c. Allow to dwell in IO space for 60 seconds.
- d. Flush with **2 to 5 mL** of **NORMAL SALINE**.

### **Infant/Child - Unresponsive to Pain:**

- a. Prime extension set with **NORMAL SALINE**.  
*Note that the priming volume of the EZ-Connect® Extension Set is approximately 1 mL*
- b. Flush with **2 to 5 mL** of **NORMAL SALINE**

7. Stabilize and monitor site and limb for extravasation or other complications.

# Hemorrhage Control

## *-Tourniquet-*

### **Clinical Indications:**

- Life threatening hemorrhage that cannot be controlled by other means, such as direct pressure.
- Serious or life threatening extremity hemorrhage and operational considerations (location, tactical or hazmat environment, etc.) prevent the use of standard hemorrhage control techniques.

### **Procedure:**

1. Apply commercially made tourniquet approximately 2-3 inches proximal to the wound / injury.
  - a. Do NOT apply tourniquet over a joint. If wound is over a joint or just distal to a joint, apply the tourniquet just proximal to the joint.
  - b. Do NOT apply tourniquet over a fracture.
2. Tighten tourniquet until bleeding stops and/or distal pulse is absent.
3. Document time of application and location of tourniquet and ensure that receiving facility is aware of time of placement.
4. Tourniquet should be easily visible on affected limb.
5. Manage pain per the PAIN MANAGEMENT Protocol.
6. If bleeding continues, place a second tourniquet proximal to the first.
7. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially to eliminate distal pulse.
8. Do not release a properly applied tourniquet until the patient reaches definitive care.

# Hemorrhage Control

## *-SAM® Junctional Tourniquet-*

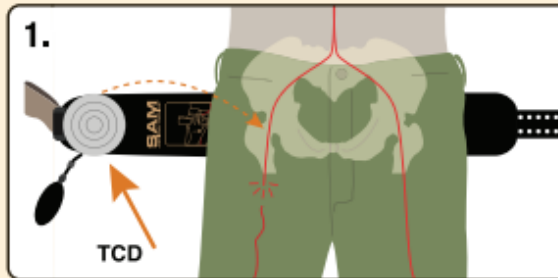
### Clinical Indications:

- Serious or life threatening hemorrhage from a site is not amenable to tourniquet placement (i.e. junctional injury).

### Procedure:

#### TO CONTROL DIFFICULT BLEEDS IN THE INGUINAL AREA

Part No. SJT 102,101



Slide the belt underneath the patient, positioning the Target Compression Device (TCD) over the area to be compressed. Use sterile gauze or hemostatic dressing if targeting directly over a wound. For bi-lateral application, use a second TCD.



Hold the TCD in place and connect the belt using the buckle.



Pull the **BROWN HANDLES** away from each other until the buckle secures. You will hear an audible click. Fasten excess belt in place by pressing it down on the Velcro. You may hear a second click once the belt is secure.



Use the hand pump to inflate the TCD until hemorrhage stops. Monitor patient during transport for hemorrhage control and adjust the device if necessary. **TO REMOVE**, unbuckle the belt.



# Hemorrhage Control

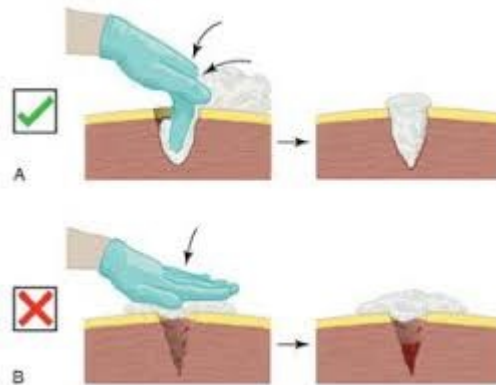
## *-Wound Packing / Hemostatic Gauze-*

### Clinical Indications:

- Serious hemorrhage that can not be controlled by other means.

### Procedure:

1. Apply direct pressure to bleeding site.
2. If the bleeding site is not amenable to tourniquet placement (i.e. junctional injury), pack wound tightly with a hemostatic gauze and apply direct pressure. Consider using a Junctional Hemostatic Device if available.
  - a. Begin packing the gauze into the wound with your finger, while maintaining pressure on the wound.
  - b. Completely and tightly pack the wound to stop the bleeding.
  - c. Hold direct pressure on the wound for **3 minutes**.
  - d. After applying manual pressure for 3 minutes, place a pressure dressing over the wound.





# High Performance CPR

## Purpose:

- To improve the overall survival rate of sudden out-of-hospital cardiac arrest patients within the East Central Illinois EMS System. Research indicates that High Performance CPR (HP CPR) along with Code Resource Management (CRM) can save lives. In order to have effective HP CPR ALL involved must work as team. This systematic change in treatment and management of cardiac arrest patients is based on research and practices being used in many other high performance EMS systems across the county. Minimal breaks in compressions, full chest recoil, adequate compression depth, and adequate compression rate are all components of CPR that can increase survival from cardiac arrest. Together, these components combine to create high performance CPR (HP CPR).

## Procedure:

### 1. Effective Compressions

- a. CPR should be initiated immediately upon identification of cardiac arrest as long as the scene is safe.
- b. Compressors should be rotated **every 2 minutes**.
- c. Ideally, one compressor is on each side of the patient's chest (one person compressing and the other person ready to start).
- d. Maintain compression depth of **at least 2 inches**.
- e. Compression should allow for complete chest recoil/decompression between compressions (50% Compression / 50% Decompression).
- f. Compressor shall also rotate when a decrease in ETCO<sub>2</sub> is observed.

### 2. Continuous Compressions

- a. Compressions at a rate of **100-120 per minute** for 2 minutes (use of a metronome is recommended). (Compression Fraction > 60%)
- b. Do NOT interrupt chest compressions during the 2 minute cycle for ANY reason.
- c. Treatments such as ventilations, IV/IO access, or intubation shall be done while CPR is ongoing.
- d. After completion of a two-minute cycle, a phase to assess pulses and/or defibrillate will be limited to <10 seconds.

### 3. Defibrillation

- a. Turn on the AED/monitor as soon as cardiac arrest is confirmed.
- b. Chest compressions should NOT be interrupted to remove clothing or place defibrillation pads.
- c. Compressions should continue during charging of the AED; pausing only for analysis and shock delivery.
- d. Compressors will hover over the patient with hands ready during defibrillation so compressions can start IMMEDIATELY after a defibrillation.
- e. **NO PULSE CHECKS AFTER SHOCKS.**
- f. Manual Defibrillator:
  - i. Charge to appropriate energy level as the end of the compression cycle nears (approx. 1 minute and 45 seconds into a two-minute cycle).
  - ii. At the end of the two-minute cycle, the patient will be cleared, the rhythm will be interpreted rapidly and then the patient will either be defibrillated or the defibrillator energy will be cancelled.
  - iii. This sequence must be performed within **10 seconds**.
  - iv. Rhythm interpretation will not occur after a shock, but only after the two-minute cycle of CPR is performed.

Procedure Continues

# High Performance CPR

## Procedure:

### 4. Ventilations

- a. Once an advanced airway is in place, ventilations will be performed WITHOUT STOPPING chest compression.
- b. Once an advanced airway is in place, ventilations will be asynchronous with compressions during the recoil phase (**1 ventilation for every 10 compressions** which equates to about **1 ventilations every 6 seconds**).
- c. Compressions should NOT be interrupted to place an advanced airway.

### 5. Mechanical CPR Devices

\*\*Mechanical CPR devices should be used in accordance with the devices specific instructions.

- a. Per AHA 2015 manual chest compression remain the standard of care for the treatment of cardiac arrest.
- b. Mechanical CPR devices may be reasonable alternative to conventional CPR in specific settings where delivery of high-quality manual compressions may be challenging or dangerous for the provider:
  - i. Limited rescuers available
  - ii. Prolonged CPR
  - iii. CPR during hypothermic cardiac arrest
  - iv. CPR in a moving ambulance
- c. Placement of mechanical CPR device should not create excessive interruptions in compressions.
- d. Mechanical CPR devices should be deployed by providers who have received proper training on the device and a trained provider should accompany any patient who the device is being used on for the duration of transport.
- e. Upon arrival at the hospital, the mechanical CPR device should be left in place and active until the receiving ED staff advises otherwise.
- f. Impedance Threshold Devices (ITD) should only be considered when using mechanical CPR devices that are capable of doing active compression-decompression CPR.

### 6. Advanced Life Support

- a. ALS providers will address manual defibrillation, IV/IO access medication administration and advanced airway placement, as indicated.

\*\*\* However, intubation is no longer a primary focus of cardiac arrest management and any advanced airway intervention should NOT interrupt chest compressions.
- b. Capnography should be utilized to optimize CPR performance and evaluation of ROSC.
  - i. EtCO<sub>2</sub> > 10 mm Hg is indicative of quality CPR.
  - ii. Abrupt sustained increase in EtCO<sub>2</sub> is indicative of potential ROSC.

### 7. Transport Considerations

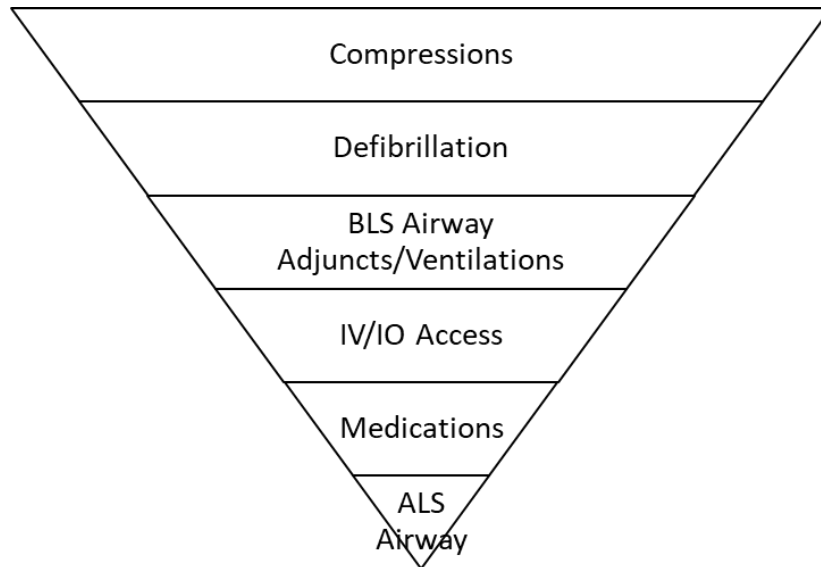
- a. Medical Cardiac Arrests generally do not benefit from “load-n-go” situations.
- b. Patient’s best chance of survival is obtaining ROSC on scene (working where found).
- c. Consider “load-n-go” for traumatic arrests.
- d. Transport rapidly after obtaining ROSC, and after prolonged resuscitation for persistent V-fib/ Pulseless V-Tach.

Procedure Continues

# High Performance CPR

## Code Resource Management:

1. Crews should coordinate their duties keeping the call priorities in mind. Intervention priorities are (in order of highest to lowest):



### 2 Provider Crew:

Provider 1 – Chest Compressions

Provider 2 – Ventilate, attach/operate AED/Defibrillator, assume crew leader responsibilities.  
(providers rotate positions every two minutes)

\*\*Roles remain the same even if providers are ALS equipped

### 3 Provider Crew:

Provider 1 – Chest Compressions

Provider 2 – Crew Leader, attach/operate AED/defibrillator

Provider 3 – Ventilate

(Providers 1 and 3 rotate every two minutes)

\*\*Roles remain the same even if providers are ALS equipped

### 4 Provider Crew:

Provider 1 – Chest Compressions

Provider 2 – Attach/operate AED/Defibrillator

Provider 3 – Ventilate

Provider 4 – Crew Leader (Preferably ALS)

(Providers 1, 2, and 3 rotate every two minutes)

\*\*Once first two roles have begun treatment, ALS providers will establish IV/IO and administer medications

### Greater Than 4 Providers:

Utilize the same initial assignments as the four provider crew. The crew leader will assign additional roles such as informing the family of patient status, gathering patient information, and documenting the medical interventions performed on the call. If resources allow, rotate additional providers to do chest compressions to achieve optimal performance.

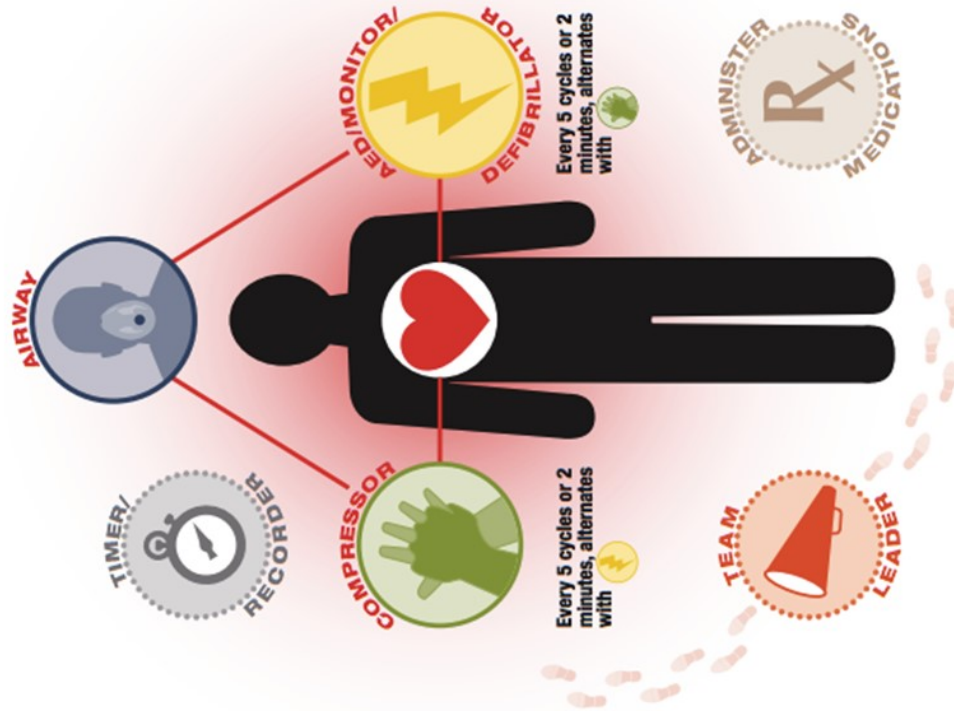
Procedure Continues

# High Performance CPR

## Positions for 6-Person High-Performance Teams\*

### Resuscitation Triangle Roles

 <p><b>Compressor</b></p> <ul style="list-style-type: none"> <li>Assesses the patient</li> <li>Does 5 cycles of chest compressions</li> <li>Alternates with AED/Monitor/Defibrillator every 5 cycles or 2 minutes (or earlier if signs of fatigue set in)</li> </ul>	 <p><b>AED/Monitor/Defibrillator</b></p> <ul style="list-style-type: none"> <li>Brings and operates the AED/monitor/defibrillator</li> <li>Alternates with Compressor every 5 cycles or 2 minutes (or earlier if signs of fatigue set in), ideally during rhythm analysis</li> <li>If a monitor is present, places it in a position where it can be seen by the Team Leader (and most of the team)</li> </ul>	 <p><b>Airway</b></p> <ul style="list-style-type: none"> <li>Opens and maintains the airway</li> <li>Provides ventilation</li> </ul>
<p>The team owns the code. No team member leaves the triangle except to protect his or her safety.</p>		



\*This is a suggested team formation. Roles may be adapted to local protocol.



### Leadership Roles

 <p><b>Team Leader</b></p> <ul style="list-style-type: none"> <li>Every resuscitation team must have a defined leader</li> <li>Assigns roles to team members</li> <li>Makes treatment decisions</li> <li>Provides feedback to the rest of the team as needed</li> <li>Assumes responsibility for roles not assigned</li> </ul>	 <p><b>Administer Medications</b></p> <ul style="list-style-type: none"> <li>An ALS provider role</li> <li>Administers medications</li> </ul>	 <p><b>Timer/Recorder</b></p> <ul style="list-style-type: none"> <li>Records the time of interventions and medications (and announces when these are next due)</li> <li>Records the frequency and duration of interruptions in compressions</li> <li>Communicates these to the Team Leader (and the rest of the team)</li> </ul>
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# Mechanical CPR Device - LUCAS™

## Clinical Indications:

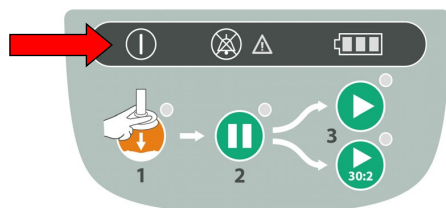
- Adult patient in non-traumatic cardiac arrest
  - Intended for use as an adjunct to manual CPR when effective manual CPR is not possible (e.g. during patient transport or extended CPR when fatigue may prohibit the delivery of effective / consistent compression to the victim, or when insufficient EMS personnel are available to provide effective CPR)

## Contraindications:

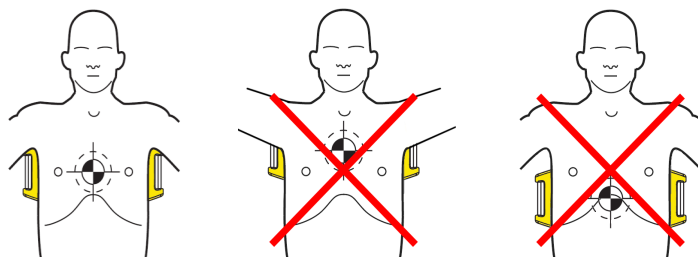
- Pediatric patients in cardiac arrest
- Patients suffering traumatic cardiac arrest
- Patients who do not fit within the device
  - Patients who are too large and with whom you cannot press the pressure pad down 2 inches
  - Patients who are too small and with whom you cannot pull the pressure pad down to touch the sternum

## Placement Procedure:

1. All therapies related to the management of a patient in cardiac arrest should be continued as outlined in the protocols.
  - a. Manual chest compression should be initiated **immediately** while the LUCAS™ device is being placed on the patient.
  - b. Limit interruptions in chest compressions to **10 seconds or less**.
  - c. **Early defibrillation** should be considered and provided as indicated.
  - d. **Do NOT delay manual CPR for the LUCAS**. Continue manual CPR until the device can be placed.
2. While resuscitative measures are initiated, unpack the LUCAS™ device and place on the patient in the following manner:
  - a. Push **ON/OFF** on the user control panel for 1 second to start the self test.



- b. **Back Plate Placement** - Remove the LUCAS™ back plate from the carrying bag and place under the patient, immediately below the arm pits. Placement should occur during a scheduled discontinuation of compressions (e.g. after five cycles of 30:2 or two minutes of uninterrupted compressions)

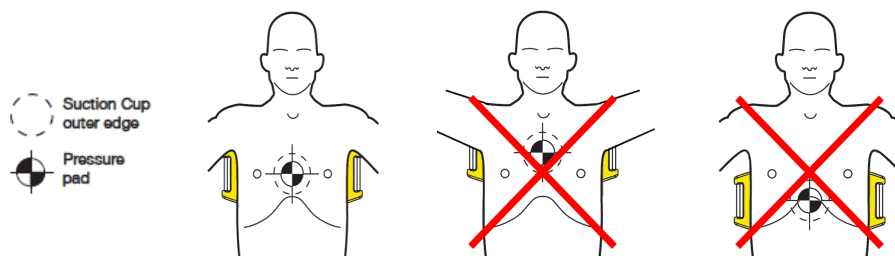


Procedure Continues

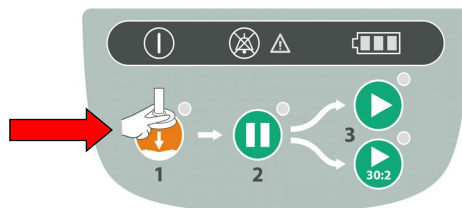
# Mechanical CPR Device - LUCAS™

## Placement Procedure:

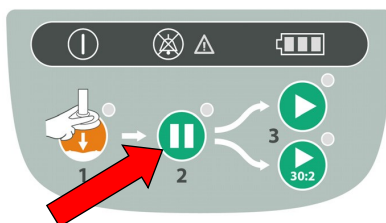
- c. Continue manual CPR.
- d. Hold the handles on the support legs to remove the LUCAS™ upper part from the bag. Pull the release rings once to make sure that the claw locks are open.
- e. Approach the patient from the side opposite the person performing CPR.
- f. Attach the support leg that is nearest to you to the back plate and listen for a “click”. Stop CPR and attach the other support leg to the back plate and listen for a “click”.
- g. Pull up once to make sure that the parts are correctly attached.
- h. Use two fingers to ensure that the pressure pad in the suction cup is in the correct position. The lower edge of the suction cup is immediately above the end of the sternum. If necessary, move the device by pulling the support legs to adjust the position.



- i. Press the orange **ADJUST Mode (1)** button on the control panel. Push the suction cup down with two fingers until the pressure pad touches the patient's chest without compressing the chest.



- j. Press the **PAUSE Mode (2)** button to lock the start position once the position of the suction cup and compression arm is in satisfactory position.
  - If the position is incorrect, press the **ADJUST Mode (1)** button, adjust the suction cup and/or compression arm and press the **PAUSE Mode (2)** button once in satisfactory position.



Procedure Continues

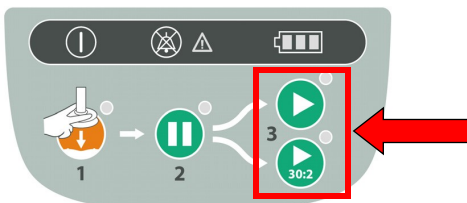


# Mechanical CPR Device - LUCAS™

## Placement Procedure:

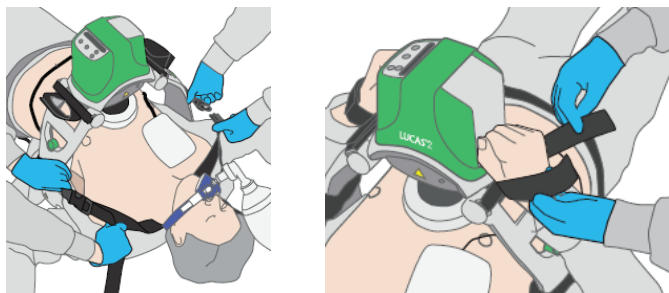
### 3. Start Compressions.

- If an advanced airway is **NOT** in place, press the green **ACTIVE (30:2)** button.
- If an advanced airway is in place, press the green **ACTIVE (continuous)** button.



### 4. Patient Stabilization / Transport

- Remove the cushion strap from the carrying bag and extend the cushion strap fully at the buckles.
- Carefully lift the patient's head and put the cushion behind the patient's neck. Position the cushion as near to the patient's shoulders as possible.
- Connect the buckles on the support leg straps with the buckles on the cushion strap, making sure that the straps are not twisted.
- Tighten the cushion strap.
- Place the patients arms in the wrist straps provided at the top of the LUCAS™ Device.



## Miscellaneous Procedure:

### 1. Defibrillation:

- Defibrillation can be performed while LUCAS™ operates.
- You can apply the defibrillation electrodes before or after LUCAS™ has been put in position.
- Position the defibrillation electrodes so that they are not under the suction cup.
- Defibrillation should be performed according to the appropriate protocol and following the instructions from the manufacturer of the defibrillator.

### 2. Pulse Checks

- To analyze the heart rhythm and/or check for return of spontaneous pulses, press the **PAUSE Mode** button. Rhythm checks should be done every 2 minutes and limited to no more than 10 seconds.

### 3. Malfunction of LUCAS™ Device

- If disruption or malfunction of the LUCAS™ Device occurs, immediately revert to Manual CPR.

# Mechanical CPR Device - ZOLL® AutoPulse®

## Clinical Indications:

- Adult patient in non-traumatic cardiac arrest
  - Intended for use as an adjunct to manual CPR when effective manual CPR is not possible (e.g. during patient transport or extended CPR when fatigue may prohibit the delivery of effective/consistent compression to the victim, or when insufficient EMS personnel are available to provide effective CPR)

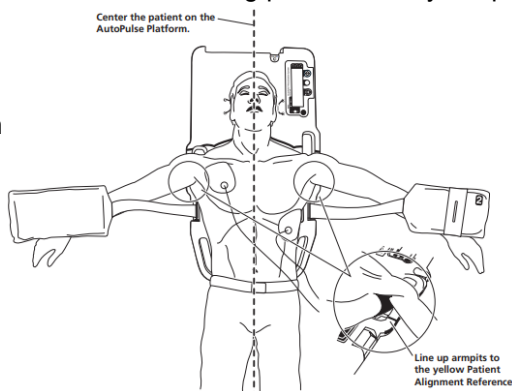
## Contraindications:

- Pediatric patients in cardiac arrest
- Patients suffering traumatic cardiac arrest
  - Patients who do not fit within the AutoPulse® Operating Parameters.

Patient Parameter	AutoPulse® Specification
Patient chest circumference permitted	29.9 to 51.2 in (76 to 130 cm)
Patient chest width permitted	9.8 to 15 in (25 to 38 cm)
Maximum patient weight permitted	300 lbs. (136 kg)

## Procedure:

1. All therapies related to the management of a patient in cardiac arrest should be continued as outlined in the protocols.
  - a. Manual chest compression should be initiated **immediately** while the AutoPulse® device is being placed on the patient.
  - b. Limit interruptions in chest compressions to **10 seconds or less**.
  - c. **Early defibrillation** should be considered and provided as indicated.
  - d. **Do NOT delay manual CPR for the AutoPulse®**. Continue manual CPR until the device can be placed.
2. While resuscitative measures are initiated, power up the AutoPulse® by pressing the On/Off button located on the top (“head”) edge of the AutoPulse® Platform.
  - a. The AutoPulse® illuminates the green Power LED on the User Control Panel and performs its self-tests.
  - b. The AutoPulse® will indicate that it is ready for use.
3. Briefly stop CPR and sit the patient up and remove patient’s clothing to ensure skin-to-platform contact.
4. Slide the AutoPulse® Platform into position behind the sitting patient and lay the patient down onto the platform.
  - a. The patient should be centered and the patient’s armpits should be aligned with the yellow patient alignment lines on the platform.



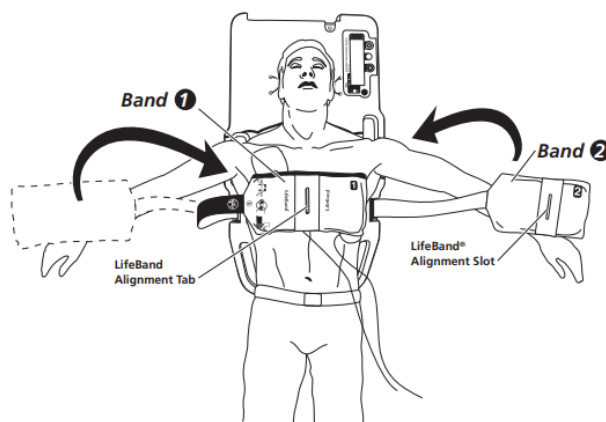
Procedure Continues



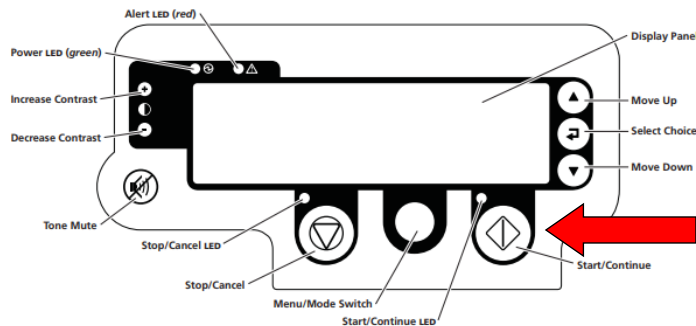
# Mechanical CPR Device - ZOLL® AutoPulse®

## Procedure:

5. Close the LifeBand® around the patient's chest.
  - a. Place band 1 on top of patient's chest.
  - b. Locate mating slot of band 2 over the alignment tab 1.
  - c. Press the bands together to engage and secure the Velcro fastener.
  - d. Lift up the LifeBand® to its fullest extension, ensuring that the side bands are at a 90 degree angle to the platform, that they are not twisted and that there are no obstructions.
  - e. Center the LifeBand® on the patient's chest, placing it such that its center is over the area upon which manual compressions are conducted.



6. Press and release the **Start / Continue** button once. The AutoPulse® automatically adjusts the bands to the patient's chest.
  - a. The AutoPulse® will pause for 3 seconds to allow you to verify that the patient is properly aligned and that the LifeBand® has taken up any slack in the bands.
  - b. If the patient is not properly aligned, press the **Stop / Cancel** button, realign the patient, and begin compression again.
7. After the 3 second verify patient alignment pause is complete, compressions will automatically begin. You may press the **Start / Continue** button to immediately initiate compressions ahead of that time.
  - a. Depending on the Mode setting in Administrative Menus, the AutoPulse® will perform 30:2 or Continuous compressions.



8. To access the patient or to pause the AutoPulse® for any reason, press the **Stop / Cancel** button.
9. To restart compression, press the **Start / Continue** button.

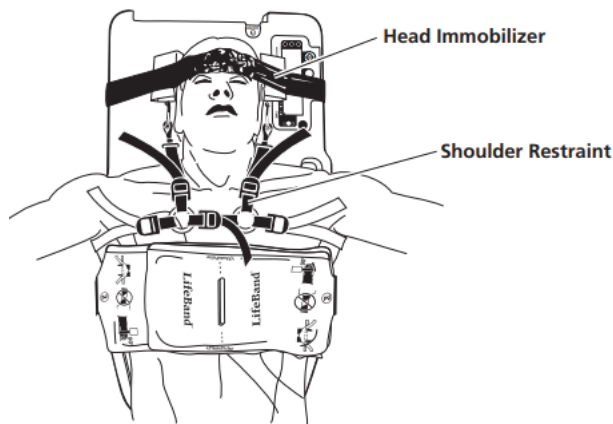
Procedure Continues

# Mechanical CPR Device - ZOLL® AutoPulse®

## Procedure:

### 10. Patient Stabilization / Transport

- a. Attach the Shoulder Restraint to keep the patient properly aligned on the AutoPulse® Platform.
- b. The Head Immobilizer assists in keeping the patients head from moving, especially when combined with a cervical collar.



### 11. Always ensure the following:

- a. Make sure that the patient's armpits and the upper edge of the LifeBand® are aligned with the yellow line on the AutoPulse®.
- b. Make sure that the LifeBand® is not twisted and properly mated with the Velcro.
- c. Maintain the LifeBand® at 90 degrees with the AutoPulse® Platform. Ensure that the LifeBand® is not impeded by anything such as the patient's arms, clothing, straps, and buckles that may interfere with the movement of the LifeBand®.

### 12. Malfunction of AutoPulse® Device

- a. If disruption or malfunction of the AutoPulse® Device occurs, immediately revert to Manual CPR.

# Physical Restraints

## Clinical Indications:

- Any patient who may harm themselves or others may be gently restrained to prevent injury to the patient or crew. This restraint must be in a humane manner and used only as a last resort. Other means to prevent injury to the patient or crew must be attempted first. These efforts could include reality orientation, distraction techniques, or other less restrictive therapeutic means. Physical or chemical restraint should be a last resort technique.

## Procedure:

1. Attempt less restrictive means of managing the patient.
2. Request law enforcement assistance wherever and whenever possible.
3. Ensure adequate personnel are present. This generally means four people, one for each of the patient's extremities.
4. Restrain the patient in a lateral or supine position. No devices such as backboards, splints, or other devices will be on top of the patient. The patient will never be restrained in the prone position.
5. The patient's upper extremities should be restrained with one arm at or above the level of the head and one arm at or below the waist level if possible, unless clinically inappropriate.
6. The patient must be under constant observation of the EMS crew at ALL times. This includes direct visualization of the patient as well as cardiac and pulse oximetry monitoring whenever possible.
7. The extremities that are restrained will have a circulation check at least every 15 minutes. The first of these checks should occur as soon after placement of the restraints as possible. This MUST be documented in the patient care report (PCR).
8. Documentation in the PCR should include the reason for the use of restraints, the type of restraints used, and the time restraints were placed.
9. If the above actions are unsuccessful, or if the patient is resisting the restraints, consider administering medications per the AGITATED OR VIOLENT PATIENT / BEHAVIORAL EMERGENCIES Protocol.
10. If a patient is restrained by law enforcement personnel with handcuffs or other devices EMS personnel cannot remove, a law enforcement officer must accompany the patient to the hospital in the transporting ambulance.
11. **All restraints should have the ability to be quickly released, if necessary.**

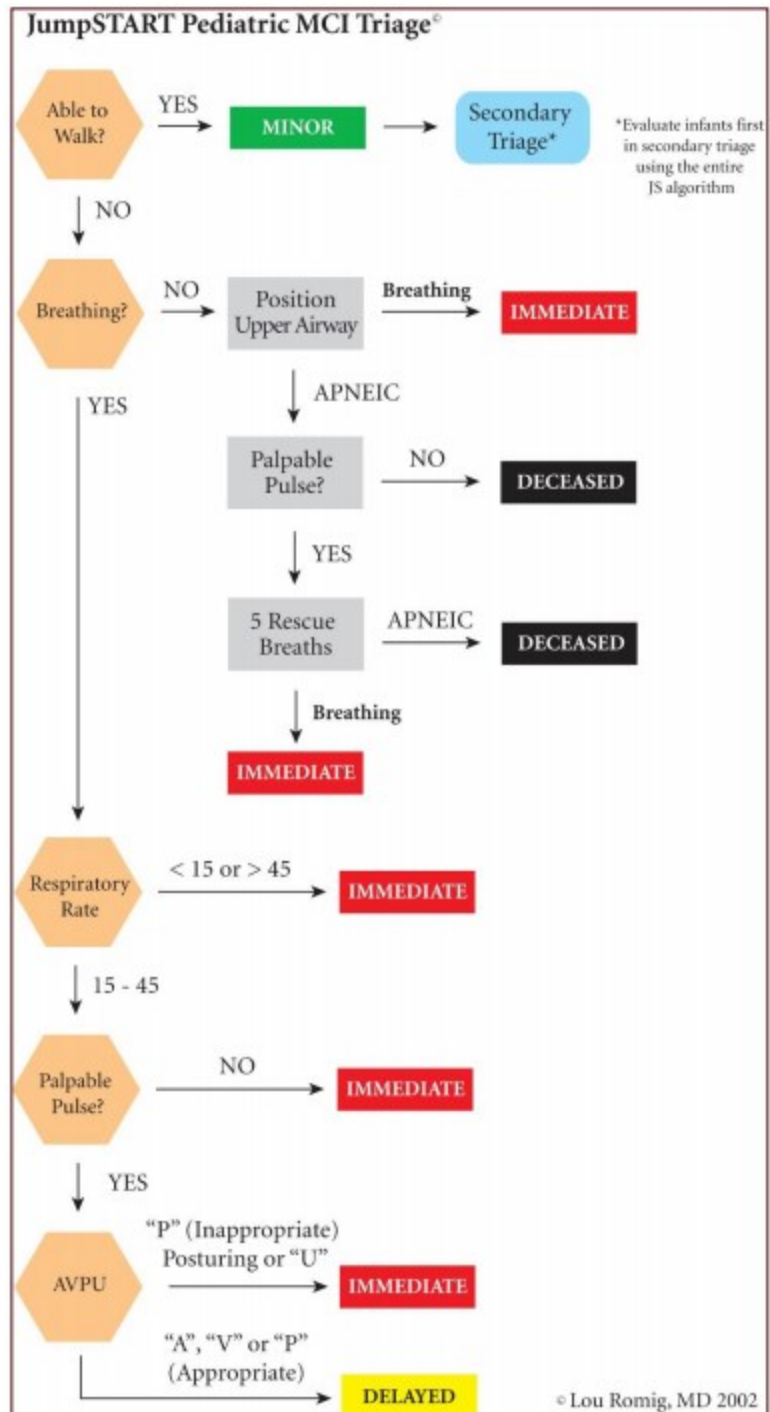
# JumpSTART<sup>®</sup> Triage

## Clinical Indications:

- Anytime an event overwhelms the available resources and the victim appears to be a child

## Procedure:

- Start where you stand.
- Identify the uninjured or “walking wounded” and direct them to a designated area.
- Move in an orderly and systematic manner through the remaining victims, stopping at each person for a quick assessment and tagging focusing on Respirations, Perfusion and Mental Status. The stop at each patient should not take more than 30-60 seconds.



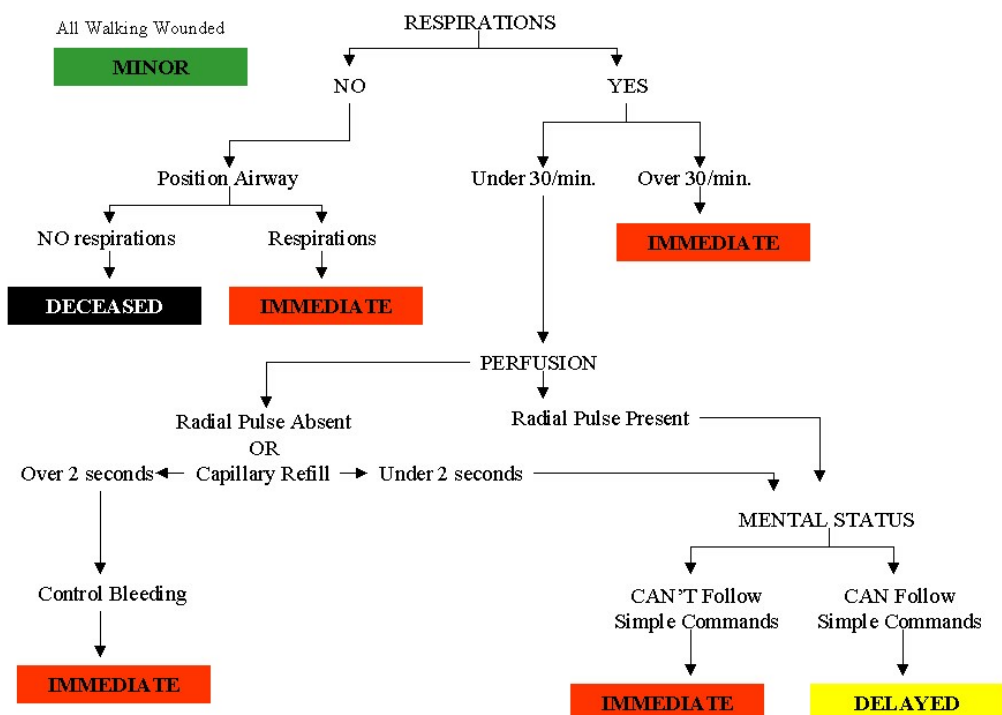
# START Triage

## Clinical Indications:

- Anytime an event overwhelms the available resources and the victim appears to be an adult

## Procedure:

- Start where you stand.
- Identify the uninjured or "walking wounded" and direct them to a designated area.
- Move in an orderly and systematic manner through the remaining victims, stopping at each person for a quick assessment and tagging focusing on Respirations, Perfusion and Mental Status. The stop at each patient should not take more than 30-60 seconds.



# EMS Guide

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## HeartWare Ventricular Assist System®



This guide is produced by ICCAC – The International Consortium of Circulatory Assist Clinicians. The ICCAC is the professional society for MCS Clinicians throughout the world. It has been vetted by experts in MCS, Air Medical Transport, and Emergency Services. It should not replace the device operating manual as a primary source of information.

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# Questions and Answers Ventricular Assist Device

## What is a Ventricular Assist Device (VAD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.

## How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

## What are the parts of a VAD?

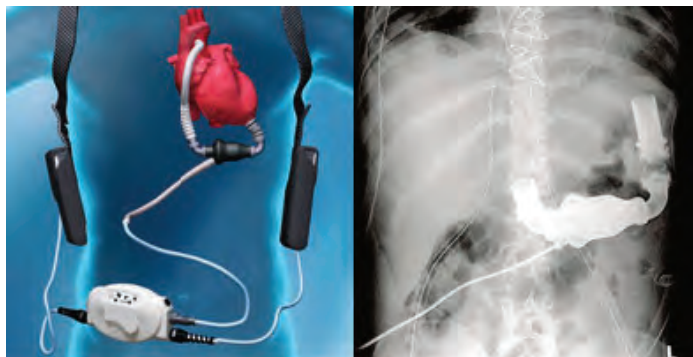
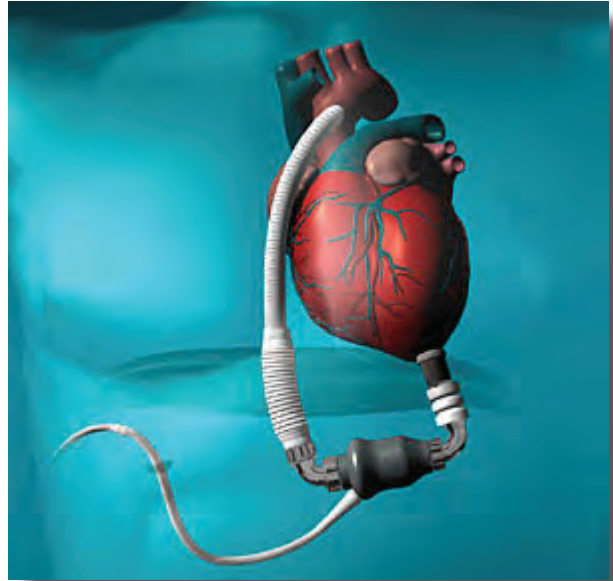
The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

## What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patients shoulders.

## What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.



The portability of the HeartMate II enables patients to resume many of their normal daily activities.

## Color Coding System

**MOST** patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are caring for.

**HEARTMATE III**

**HEARTMATE II**

**HEARTWARE**

**JARVIK 2000**

**FREEDOM DRIVER**  
Total Artificial Heart



# Patient Management For VADs

1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a “whirling sound”.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is.**
5. **Match the color on the device tag to the EMS Guide.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP).**
9. **If no Doppler, use the Mean on the non invasive blood pressure machine.**
10. **Transport to closest VAD center. Call the number on the device to get advice.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

# HeartWare® Ventricular Assist System

## 1. Can I do external CPR?

Chest compressions may pose a risk of dislodgment – use clinical judgment. If chest compressions are administered, confirm function and positioning of the pump.

## 2. If not, is there a “hand pump” or external device to use?

No.

## 3. If the device slows down (low flow state), what alarms will go off?

The device runs at a fixed speed. If a low flow state occurs, an alarm will be heard, and the controller display will show a yellow triangle and “Low Flow – Call” message.



## 4. How can I speed up the rate of the device?

It is not possible to adjust the pump speed in the prehospital setting. Okay to give IV fluids.

## 5. Do I need to heparinize the patient if it slows down?

Call the accepting VAD facility for guidance.

## 6. Can the patient be defibrillated while connected to the device?

Yes.

## 7. If the patient can be defibrillated, is there anything I have to disconnect before defibrillating?

No, defibrillate per protocol.

## 8. Does the patient have a pulse with this device?

The patient may not have a palpable pulse. Depending on the patient's own heart function, you may be able to feel a thready pulse.

## 9. What are acceptable vital sign parameters?

Goal Mean Arterial Pressure (MAP) is <85 mmHg. Use a Doppler as the first option to assess blood pressure. If you are using a Doppler, place the blood pressure cuff on the patient arm. As you release the pressure in the blood pressure cuff, the first sound you hear with the Doppler is the MAP. If that is not available, use a non-invasive BP (NIBP).

## 10. Can this patient be externally paced?

Yes



## FAQs

- May not be able to obtain cuff pressure (continuous flow pump)
- Pump connected to electric line (driveline) exiting patient's abdominal area and is attached to computer (controller) which runs the pump.
- Pump does not affect EKG, but patient may or may not be symptomatic even with ventricular arrhythmias.
- All ACLS drugs may be given.
- No hand pump is available. This is a rotary (continuous flow) pump with typical speed ranges of 2400 – 3200 RPMs. The patient should have back-up equipment.
- The controller draws power from one battery at a time. A fully charged battery will provide 4-6 hours of power. Both the battery and controller have status lights to indicate the amount of power remaining.
- Transport by ground to implanting facility if possible.
- Be sure to bring **ALL** of the patient's equipment with them.

# HeartWare® Ventricular Assist System Emergency Operation



**CONTROLLER**



**BATTERY**

## ALARM ADAPTER

- Used to silence the internal NO POWER ALARM.
- Should only be used on a controller that is NOT connected to a patient's pump.
- Must be inserted into the blue connector of the original controller after a controller exchange BUT before the power sources are disconnected or the NO Power alarm will sound for up to two hours.



## DRIVELINE CONNECTION

### To Connect to Controller:

- Align the two red marks and push together. An audible click will be heard confirming proper connection. (Figure A)
- The Driveline Cover must completely cover the Controller's silver driveline connector to protect against static discharge. (Figure B)
- NOTE: an audible click should be heard when connecting the Driveline or Driveline extension to the controller. Failure to use the Driveline Cover may cause an Electrical Fault Alarm.



**Figure A**



**Figure B**

## CONNECTING POWER TO CONTROLLER

### To Connect a Charged Battery:

- Grasp the cable of the charged battery at the back end of the connector (leaving front end of connector free to rotate)
- Line up the solid white arrow on the connector with the white dot on the Controller.
- Gently push (but DO NOT twist) the battery cable into the Controller until it naturally locks into place; you should hear an audible click.
- Confirm that the battery cable is properly locked on the controller by gently pulling the cable near the controller power connector.
- DO NOT force the battery cable into the controller connector without correct alignment as it may result in damaged connectors .



## TO DISCONNECT A DEPLETED BATTERY

- Make sure there is a fully charged battery available to replace the depleted one.
- Disconnect the depleted battery by turning the connector sleeve counterclockwise until it stops.
- Pull the connector straight out from the controller.



# HeartWare® Ventricular Assist System Emergency Operation

## STEPS TO EXCHANGE THE CONTROLLER

**Step 1:** Have the patient sit or lie down.

**Step 2:** Place the new controller within easy reach.

**Step 3:** Connect back-up power sources (batteries or AC Power) to the new controller.

- Confirm that the power cables are properly locked on the controller by gently pulling on the cable near the connector.
- A “Power Disconnect” alarm will activate if a second power source is not connected to the new controller within 20 seconds of controller power up
- A “VAD Stopped” alarm will activate if the pump driveline is not connected to the new controller within 10 seconds - this alarm will resolve once the pump driveline is connected

**Step 4:** Pull back the white driveline cover from the original controller’s silver connector.

**Step 5:** Disconnect the driveline from the original controller by pulling the silver connector away from the controller. Do not disconnect by pulling on the driveline cable. A “VAD Stopped” alarm may activate. Don’t panic. You can silence the alarm after restarting the pump, which is the priority.

**Step 6:** Connect the driveline to the new controller (align the two red marks and push together). If the “VAD Stopped” alarm was active on the new controller, it will now resolve.

**Step 7:** The pump should restart. Verify the pump is working (RPM, L/min, Watts).

**Step 8: IF THE PUMP DOES NOT RESTART, CALL FOR MEDICAL ASSISTANCE IMMEDIATELY.**

**Step 9:** Insert the Alarm Adapter into the blue connector on the original controller.

- Disconnect both power sources from the original controller.
- The controller will be turned off and all alarms silenced.

**Step 10:** Slide the white driveline cover up to cover new controller’s silver connector.

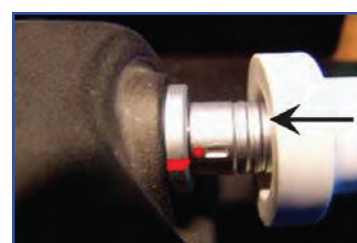
**Step 11:** Contact the VAD Center or Implanting hospital for a new backup controller.



**Step 3**



**Step 4**



**Step 6**



**Step 9**



**Step 10**



# HeartWare® Ventricular Assist System Troubleshooting

ALARM TYPE	ALARM DISPLAY (Line 1)	ACTION (Line 2)
High - Critical (FLASHING RED)	VAD STOPPED	CONNECT DRIVELINE
	VAD STOPPED	CHANGE CONTROLLER
	CRITICAL BATTERY 1	REPLACE BATTERY 1
	CRITICAL BATTERY 2	REPLACE BATTERY 2
	CONTROLLER FAILED	CHANGE CONTROLLER
MEDIUM (FLASHING YELLOW)	CONTROLLER FAULT	CALL ACCEPTING VAD HOSPITAL
	CONTROLLER FAULT	CALL: ALARMS OFF
	HIGH WATTS	CALL ACCEPTING VAD HOSPITAL
	ELECTRICAL FAULT	CALL ACCEPTING VAD HOSPITAL
	LOW FLOW	CALL ACCEPTING VAD HOSPITAL
	SUCTION	CALL ACCEPTING VAD HOSPITAL
LOW (SOLID YELLOW)	LOW BATTERY 1	REPLACE BATTERY 1
	LOW BATTERY 2	REPLACE BATTERY 2
	POWER DISCONNECT	RECONNECT POWER 1
	POWER DISCONNECT	RECONNECT POWER 2

# EMS Guide

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## HeartMate II®



This guide is produced by ICCAC – The International Consortium of Circulatory Assist Clinicians. The ICCAC is the professional society for MCS Clinicians throughout the world. It has been vetted by experts in MCS, Air Medical Transport, and Emergency Services. It should not replace the device operating manual as a primary source of information.

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# Questions and Answers Ventricular Assist Device

## What is a Ventricular Assist Device (VAD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.

## How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

## What are the parts of a VAD?

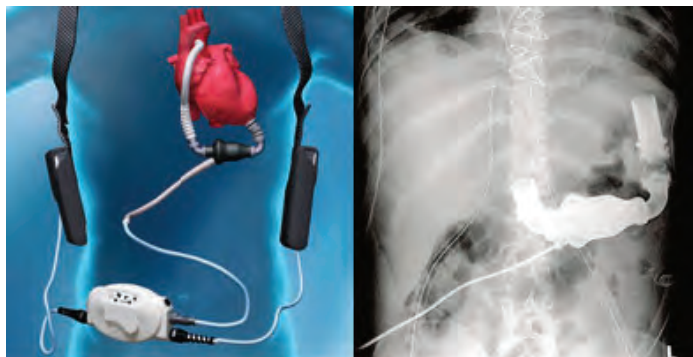
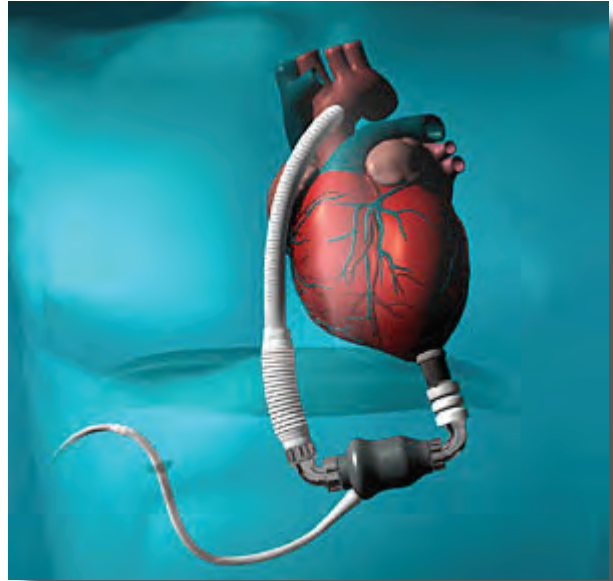
The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

## What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patients shoulders.

## What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.



The portability of the HeartMate II enables patients to resume many of their normal daily activities.

## Color Coding System

**MOST** patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are caring for.

**HEARTMATE III**

**HEARTMATE II**

**HEARTWARE**

**JARVIK 2000**

**FREEDOM DRIVER**  
Total Artificial Heart



# Patient Management For VADs

1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a “whirling sound”.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is.**
5. **Match the color on the device tag to the EMS Guide.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP).**
9. **If no Doppler, use the Mean on the non invasive blood pressure machine.**
10. **Transport to closest VAD center. Call the number on the device to get advice.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

# HeartMate II®

- 1. Can I do external CPR?**  
Only if absolutely necessary
- 2. If not, is there a “hand pump” or external device to use?**  
No.
- 3. If the device slows down (low flow state), what alarms will go off?**  
A red heart alarm light indicator and steady audio alarm will sound if less than 2.5 lmp. Can give a bolus of normal saline and transport to an LVAD center.
- 4. How can I speed up the rate of the device?**  
No, it is a fixed speed.
- 5. Do I need to heparinize the patient if it slows down?**  
Usually no, but you will need to check with implanting center.
- 6. Can the patient be defibrillated while connected to the device?**  
Yes.
- 7. If the patient can be defibrillated, is there anything I have to disconnect before defibrillating?**  
No.
- 8. Does the patient have a pulse with this device?**  
May have weak pulse or lack of palpable pulse.
- 9. What are acceptable vital sign parameters?**  
MAP 70 - 90 mm Hg with a narrow pulse pressure
- 10. Can this patient be externally paced?**  
Yes.

## FAQs

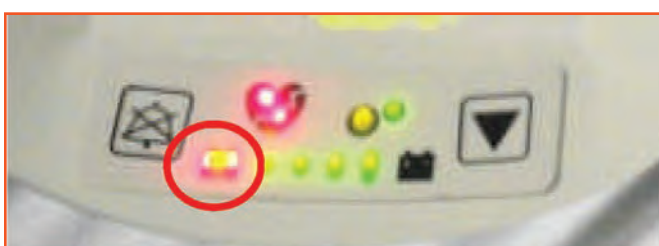
- May not be able to obtain cuff pressure (continuous flow pump).
- Pump connected to electric line exiting patient’s abdominal area and is attached to computer which runs the pump.
- Pump does not affect EKG
- All ACLS drugs may be given.
- No hand pump is available.
- A set of black batteries last approximately 3 hours, gray batteries last 8-10 hours.
- Any emergency mode of transportation is ok. These patients are permitted to fly.
- Be sure to bring **ALL** of the patient’s equipment with them.

*Adapted from Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport in ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010 in press.*

## Trouble Shooting HeartMate II® When the Pump Has Stopped

- Be sure to bring ALL of the patient’s equipment with them.
- Fix any loose connection(s) to restart the pump.
- If the pump does not restart and the patient is connected to batteries replace the current batteries with a new, fully-charged pair. (see *changing batteries section on next page*)
- If pump does not restart, change controllers. (see *changing controllers section on next page*)

## Alarms: Emergency Procedures



**Yellow or Red Battery Alarm:** Need to Change Batteries. See changing batteries section on next page.

**Red Heart Flashing Alarm:** This may indicate a Low Flow Hazard. Check patient--the flow may be too low. If patient is hypovolemic, give volume. If patient is in right heart failure-- treat per protocol. If the pump has stopped check connections, batteries and controllers as instructed in the section above.



# Trouble Shooting HeartMate II®

## Changing Batteries

**WARNING:** At least one power lead must be connected to a power source **AT ALL TIMES**. Do not remove both batteries at the same time or the pump will stop.

- Obtain two charged batteries from patient's accessory bag or battery charger. The charge level of each gray battery can be assessed by pressing the battery button on the battery. (Figures 3 and 4)
- Remove only **ONE** battery from the clip by pressing the button on the grey clip to unlock the battery. (Figure 1)
- Controller will start beeping and flashing green signals.
- Replace with new battery by lining up **RED** arrows on battery and clip. (Figure 2)
- Slide a new, fully-charged battery (Figure 4) into the empty battery clip by aligning the **RED** arrows. The battery will click into the clip. Gently tug at battery to ensure connection. If battery is properly secured, the beeping and green flashing will stop.
- Repeat previous steps with the second battery and battery clip.



Figure 1



Figure 2

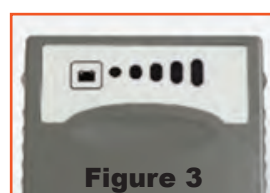


Figure 3

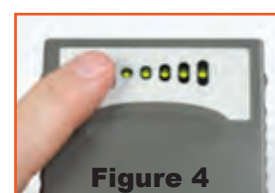


Figure 4

## Changing Controllers

- Place the replacement Controller within easy reach, along with the batteries/battery clips. The spare Controller is usually found in the patient's travel case.
- Make sure patient is sitting or lying down since the pump will momentarily stop during this procedure.
- Attach the battery clips to the spare controller by lining up the half moons and gently pushing together and attach the batteries to the spare controller by aligning the **RED** arrows. **ALARMS WILL SOUND-THIS IS OK.**



- Depress the silence alarm button (upside-down bell with circle) until the alarm is silenced on the new, replacement Controller.
- Rotate the perc lock on the replacement controller in the direction of the "unlocked" icon until the perc lock clicks into the fully-unlocked position. Repeat this same step for the original Controller until the perc lock clicks into the unlocked position.



- Disconnect the perc lead/driveline from the original controller by pressing the metal release tab on the connector socket. The pump will stop and an alarm will sound.

**Note:** The alarm will continue until power is removed from the original Controller. **Getting the replacement Controller connected and the pump restarted is the first priority.**

- Connect the replacement Controller by aligning the **BLACK LINES** on the driveline and replacement Controller and gently pushing the driveline into the replacement Controller. The pump should restart, if not complete the following steps:

**Step 1.** Firmly press the Silence Alarm or Test Select Button to restart the pump.

**Step 2.** Check the powersource to assure that power is going to the controller.

**Step 3.** Assure the perc lead is fully inserted into the socket by gently tugging on the metal end. **DO NOT** pull the lead.

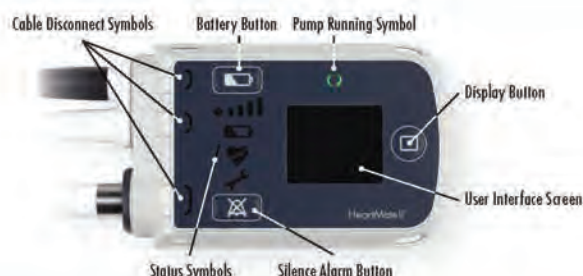


- After the pump restarts, rotate the perc lock on the new controller in the direction of the "locked" icon until the perc lock clicks into the fully-locked position. If unable to engage perc lock to the locked position, gently push the driveline into the controller to assure a proper connection. Retry to engage perc lock.
- Disconnect power from the original Controller. The original Controller will stop alarming once power is removed.



# HeartMate II® Controller Comparison Guide

## POCKET CONTROLLER™



### 3 Modes: Run, Charge, Sleep

**Run:** Driveline + Power source connected.

**Charge:** Only power source connected.

**Sleep:** No driveline or power source connected; ready to use.

### Backup Battery

An emergency backup battery is built into Pocket Controller, powering the pump for 15 minutes in the absence of an external power source. The backup battery is supplied NONSTERILE.

### Event Logger

Pocket Controller includes date/time records in event history. Pocket Controller can store 240 events.

### Green Pump Running Symbol

 Green "pump running" symbol signifies that the pump is on and running.

### Controller Buttons


**Display Button:** Enables viewing of pump parameters and backup battery charge status.

**Silence Alarm Button:** Silences hazard alarms for 2 minutes and advisory alarms for 4 hours.


**Display Button + Silence Alarm Button Together:** Displays previous six alarms.

**Battery Button:** Displays the battery power gauge when pressed. Activates a self test when held for 5 seconds then released. Enters sleep mode when driveline and external power are disconnected and button is held for 5 seconds then released.

### Self Test

 Press and hold the Battery Button for 5 seconds.

### Low Power

 **Yellow Diamond Symbol:** Displayed when only 15 minutes of external power is remaining.

 **Red Battery Symbol:** Displayed when only 5 minutes of external power is remaining.

**Backup Battery Mode:** Entered after external power is depleted. Provides 15 minutes of internal emergency backup battery power.

**Power Saver Mode:** Entered when pump has run on backup battery for 15 minutes. Pump Speed is reduced to the set Low Speed Limit.

### Starting the Pump

**>8000 RPM:** Pump starts automatically.

**<8000 RPM with Backup Battery:** Start pump by pressing any button on Pocket Controller.

**<8000 RPM with no Backup Battery:** Pump can only be started via System Monitor.


### System Monitor Event History Screen

PI Event:	10/04/13 07:20	4.8	9590	5.6	5.4	PI Event
System Information:	10/04/13 01:30	4.8	6900	5.7	6.6	* System Information

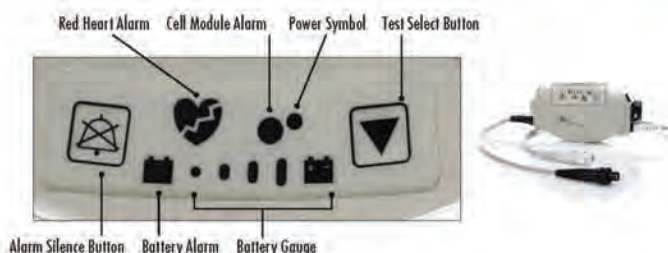
### Compatibility

System Monitors I and II, Power Module, Power Module Patient Cable (14 Volt), 14 Volt Lithium-Ion Batteries and Battery Clips.

### Alarms

 For a review of alarms and their meanings, reference HeartMate II Alarms for Clinicians, item 107526. Pocket Controller includes a yellow wrench icon to denote advisory alarms. Note that Pocket Controller includes drivelines fault detection.

## EXTERNAL PERIPHERAL CONTROLLER (EPC)



### 2 Modes: On, Off

**On:** Driveline + Power source connected.

**Off:** No driveline or power source connected.


### Cell Module Battery

No backup battery. The cell module battery powers an audible tone if EPC is removed from power while the driveline is connected. The cell module battery is supplied STERILE.

### Event Logger

EPC does not include date/time records in event history. EPC can store 120 events.

### Green Power Symbol

 Green light only means that the controller is receiving power. Listen over the pump pocket for confirmation that the pump is running.

### Controller Buttons

**Alarm Silence Button:** Displays the battery fuel gauge. Also silences hazard alarms for 2 minutes and advisory alarms for 4 hours.


**Test Select Button:** Activates a self test when held for 3 seconds.


**Note:** EPC does not include a display button or user interface screen. The Display Module is used to view pump parameters and alarm events.

### Self Test

 Press and hold the Test Select Button for 3 seconds.

### Low Power

 **Yellow Battery Symbol:** Displayed when only 15 minutes of external power is remaining.

 **Red Battery Symbol:** Displayed when only 5 minutes of external power is remaining.

**Power Saver Mode:** Entered when the battery voltage falls to a critically low level. Pump Speed is reduced to 8000 RPM.

### Starting the Pump

**>8000 RPM:** Pump starts automatically.

**<8000 RPM:** Start pump by pressing Alarm Silence Button or Test Select Button on EPC.

### System Monitor Event History Screen

PI Event:	10/04/13 07:20	4.8	9590	5.6	5.4	PI Event
System Information:	10/04/13 01:30	4.8	6900	5.7	6.6	*

### Compatibility

System Monitors I and II, Power Module, Power Base Unit (PBU), Power Module Patient Cable (12 Volt and 14 Volt), 14 Volt Lithium-Ion Batteries and Battery Clips, 12 Volt SLA and NiMH Batteries and Clips.

### Alarms

For a review of alarms and their meanings, reference HeartMate II Alarms for Clinicians, item 103851. Note that EPC does not include driveline fault detection.



# HeartMate II Controller Comparison Guide

## DRIVELINE CONNECTION

### Pocket Controller:

A safety tab is located on the back of the controller.



Unlocked

Locked

### External Peripheral Controller (EPC):

A percutaneous lock is located on the side of the controller.



Unlocked

Locked

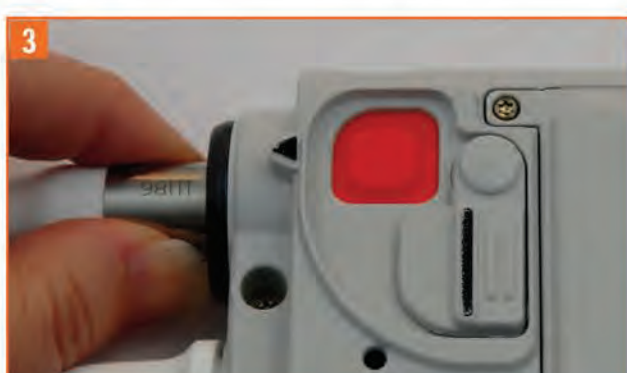
The Pocket Controller driveline connection and locking mechanism are different from the EPC. To insert and lock the driveline into Pocket Controller:



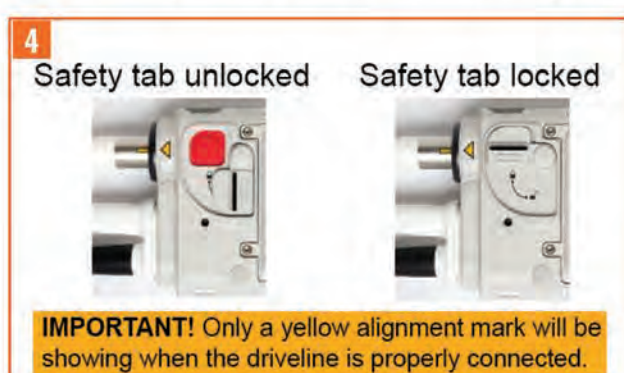
Slide the safety tab back to expose the red button.



Align the arrow on the driveline to the arrow on the Pocket Controller. Firmly insert the driveline until it snaps into place.



Tug gently on the metal portion of the driveline to ensure that it is fully engaged.



**IMPORTANT!** Only a yellow alignment mark will be showing when the driveline is properly connected.

Slide the safety tab over the red button. Ensure the safety tab completely covers the red button.

# EMS Guide

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## HeartMate 3<sup>®</sup>



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# Questions and Answers Ventricular Assist Device

## What is a Ventricular Assist Device (VAD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.

## How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

## What are the parts of a VAD?

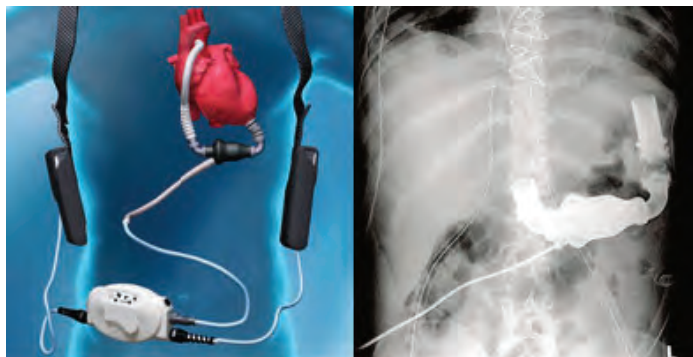
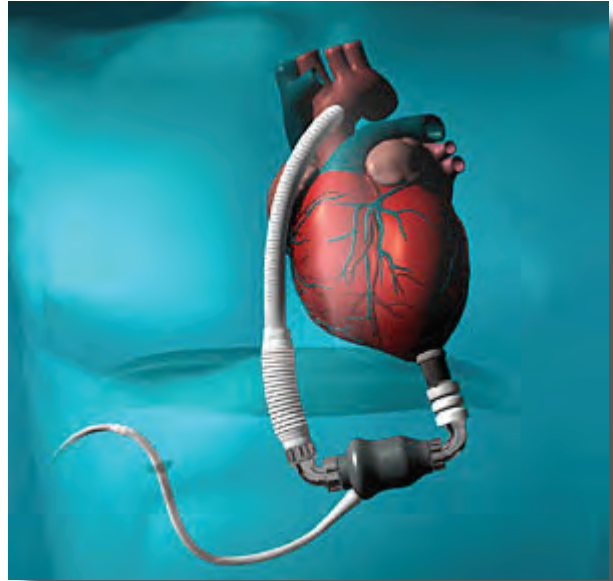
The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

## What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patients shoulders.

## What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.



The portability of the HeartMate II enables patients to resume many of their normal daily activities.

## Color Coding System

**MOST** patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are caring for.

**HEARTMATE III**

**HEARTMATE II**

**HEARTWARE**

**JARVIK 2000**

**FREEDOM DRIVER**  
Total Artificial Heart



# Patient Management For VADs

1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a “whirling sound”.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is.**
5. **Match the color on the device tag to the EMS Guide.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP).**
9. **If no Doppler, use the Mean on the non invasive blood pressure machine.**
10. **Transport to closest VAD center. Call the number on the device to get advice.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

# HeartMate III<sup>®</sup> with Pocket Controllers

- 1. Can I do external CPR?**  
Only if absolutely necessary
- 2. If not, is there a “hand pump” or external device to use?**  
No.
- 3. If the device slows down (low flow state), what alarms will go off?**  
A red heart alarm light indicator and steady audio alarm will sound if less than 2.5 lpm. Can give a bolus of normal saline and transport to an LVAD center.
- 4. How can I speed up the rate of the device?**  
No, it is a fixed speed.
- 5. Do I need to heparinize the patient if it slows down?**  
Usually no, but you will need to check with implanting center.
- 6. Can the patient be defibrillated while connected to the device?**  
Yes.
- 7. If the patient can be defibrillated, is there anything I have to disconnect before defibrillating?**  
No.
- 8. Does the patient have a pulse with this device?**  
Likely they will not because it is a continuous flow device, however some patients may have a pulse as this pump was designed with an “artificial pulse.”
- 9. What are acceptable vital sign parameters?**  
MAP 70 - 90 mm Hg with a narrow pulse pressure.
- 10. Can this patient be externally paced?**  
Yes.

## FAQs

- Pump has “artificial pulse” created by speeding up & slowing down of pump. This can be heard when auscultating the heart and differs from other continuous flow devices.
- May not be able to obtain cuff pressure (continuous flow pump).
- Pump connected to electric line exiting patient’s abdominal area and is attached to computer which runs the pump.
- Pump does not affect EKG.
- All ACLS drugs may be given.
- A set of batteries last 14 – 16 hours
- Any emergency mode of transportation is ok. These patients are permitted to fly.
- Be sure to bring **ALL** of the patient’s equipment with them.

## Trouble Shooting HeartMate III<sup>®</sup> with Pocket Controllers When the Pump Has Stopped

- Be sure to bring ALL of the patient’s equipment with them.
- Fix any loose connection(s) to restart the pump.
- If the pump does not restart and the patient is connected to batteries replace the current batteries with a new, fully-charged pair. (*see Changing Batteries section on next page*)
- If pump does not restart, change controllers. (*see Changing Controllers section on next page*)

## Alarms: Emergency Procedures



**Yellow or Red Battery Alarm:** Need to Change Batteries. See changing batteries section on next page.



**Red Heart Flashing Alarm:** This may indicate a Low Flow Hazard. Check patient--the flow may be too low. If patient is hypovolemic, give volume. If patient is in right heart failure-- treat per protocol. If the pump has stopped check connections, batteries and controllers as instructed in the section above.



# Trouble Shooting HeartMate III®

## Changing Batteries

**WARNING:** At least one power lead must be connected to a power source **AT ALL TIMES**. Do not remove both batteries at the same time or the pump will stop.

- Obtain two charged batteries from patient's accessory bag or battery charger. The charge level of each gray battery can be assessed by pressing the battery button on the battery. (Figures 1 and 2)
- Remove only **ONE** battery from the clip by pressing the button on the grey clip to unlock the battery. (Figure 3)
- Controller will start beeping and flashing yellow signals and will read **POWER DISCONNECT** on the front screen. (Figure 4)
- Replace with new battery by lining up **RED** arrows on battery and clip. Gently tug on battery to ensure connection. If battery is properly secured, the beeping and yellow flashing will stop. (Figure 5)
- Slide a new, fully-charged battery (Figure 4) into the empty battery clip by aligning the **RED** arrows. The battery will click into the clip. Gently tug at battery to ensure connection. If battery is properly secured, the beeping and green flashing will stop.
- Repeat previous steps with the second battery and battery clip.

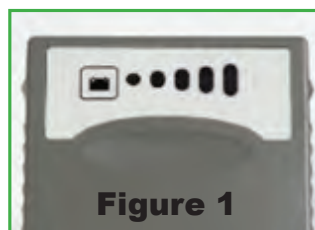


Figure 1

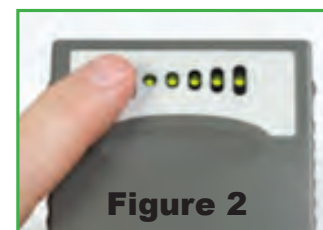


Figure 2

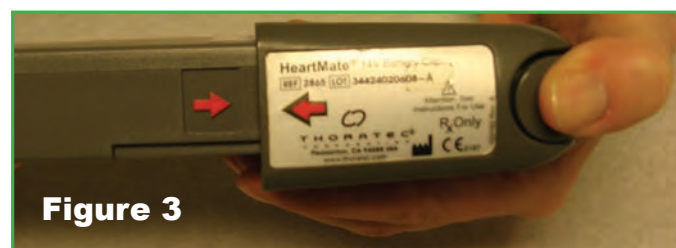


Figure 3



Figure 4



Figure 5

**CAUTION**—Investigational device. Limited by Federal (or United States) law to investigational use.

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January 2019

# Trouble Shooting HeartMate III<sup>®</sup> with Pocket Controllers

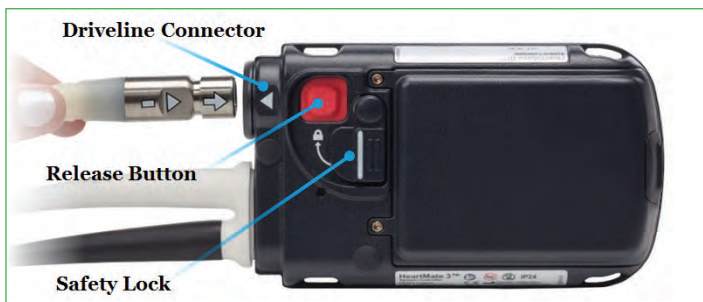
## Changing Controllers

- Place the replacement Controller within easy reach, along with the batteries/battery clips. The spare Controller is usually found in the patient's travel case.
- Make sure patient is sitting or lying down since the pump will momentarily stop during this procedure.

- Attach the battery clips to the spare controller by lining up the half moons and gently pushing together and attach the batteries to the spare controller by aligning the **RED** arrows.



- On the back of the replacement controller, rotate down the perc lock so the red tab is fully visible. Repeat this step on the original controller until the red tab is fully visible.



SAFETY LOCK  
UNLOCKED



SAFETY LOCK  
LOCKED

- Disconnect the drive-line from the original controller by pressing down on the red tab and gently pulling on the metal end. The pump will stop and an alarm will sound. **Note:** The alarm will continue until the original controller is put to sleep. You can silence the alarm by pressing the silence button.



**Getting the replacement controller connected and pump restarted is the first priority.**

- Connect the replacement Controller by aligning the **BLACK ARROWS** on the driveline and replacement Controller and gently pushing



the driveline into the replacement Controller. The pump should restart, if not complete the following steps:

- Step 1.** Firmly press the Silence Alarm or Test Select Button to restart the pump.
- Step 2.** Check the power source to assure that power is going to the controller.
- Step 3.** Assure the perc lead is fully inserted into the socket by gently tugging on the metal end. **DO NOT** pull the lead.

- After the pump restarts, rotate up the perc lock on the new controller so the red tab is fully covered. If unable to engage perc lock to a fully locked position, gently push the driveline into the controller to assure proper connection. Retry to engage perc lock.

- Disconnect power from the original Controller. The original Controller will stop alarming once power is removed.

- Hold down battery symbol for 5 full seconds for complete shutdown of old controller.



*Adapted from Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport in ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010 in press.*

**CAUTION—Investigational device. Limited by Federal (or United States) law to investigational use.**

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January 2019



# Trouble Shooting HeartMate III<sup>®</sup> with Pocket Controllers Modular Cable

The HeartMate 3 has a modular cable connection near the exit site of the driveline (Figure 1). This allows a damaged driveline to be quickly replaced (if damage is external).

- When disconnecting a driveline, **NEVER** use the modular cable connection.
- If this section of the driveline requires replacement, this must be performed at and by the implanting center. Patients are not given a back-up modular cable.
- If the connection is loose, there will be a yellow/green line at the connection showing (Figure 2). If the line is visible, it can be retightened by turning with the arrow in the locked direction. It will ratchet and stop turning once tight.



**Figure 1**



**Figure 2**



# EMS Guide

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## Total Artificial Heart



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# Patient Management For TAHs

1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate heart sounds but you can usually hear them without a stethoscope. Since this is pulsatile you should hear two sounds if properly functioning.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is. The backpack or freedom driver should have a pink tag on it. It will have the type of device this is and contact information to the implantation center.**
5. **Match the color on the device tag to the EMS Guide. The tag on the backpack or freedom driver's colored tag should matches the ems guide. This will tell you how to manage any alarms.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess Vital Signs. REMEMBER THERE IS NO EKG. THE PATIENT IS ASYSTOLIC.**
9. **YOU SHOULD BE ABLE TO GET A SYSTOLIC AND DIASTOLIC BLOOD PRESSURE.**
10. **Transport to the closest center that can care for a TAH. Look on the PINK tag to find out this information.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

# Questions and Answers for Total Artificial Heart

## What Is A Total Artificial Heart?

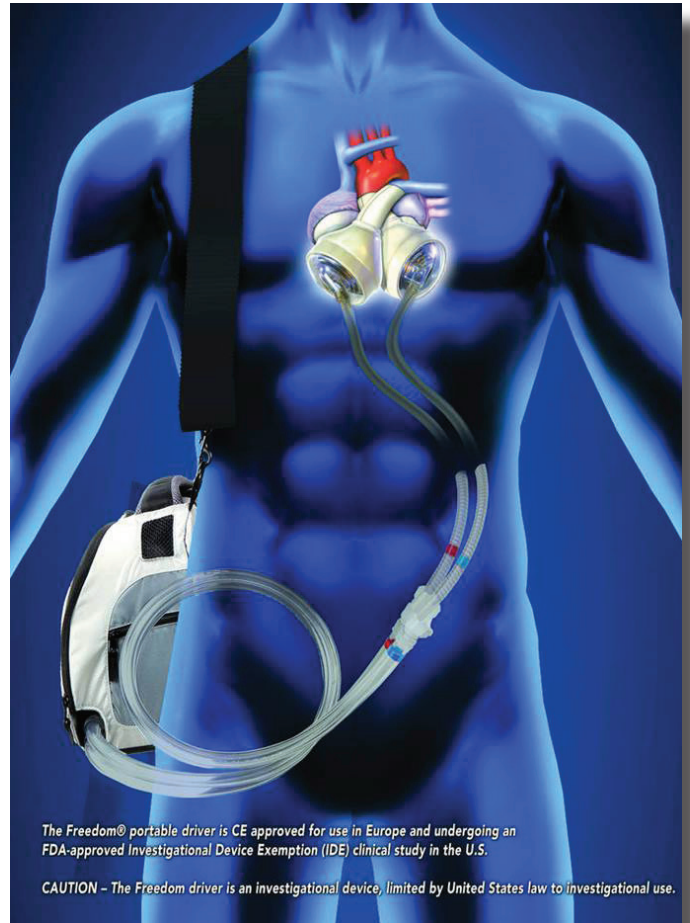
A total artificial heart (TAH) is a device that replaces the two lower chambers (ventricles) of the heart. You might benefit from a TAH if both of your ventricles don't work due to end-stage heart failure.

## What are the parts of a TAH?

The SYNCARDIA has tubes that, through holes in the abdomen, run from inside the chest to an outside power source.

## What is the power source?

Shortly after the TAD is implanted, the patient is switched to the Freedom driver. This is a mobile "driver" for patients to who are ambulatory. The patient considered discharge from the hospital while awaiting a transplant but ultimately received a heart transplant while still an inpatient. Higher rates of survival to transplant have already been proved with the TAH. Potential benefits for the portable Freedom driver include increased mobility, decreased cost, and improved quality of life.



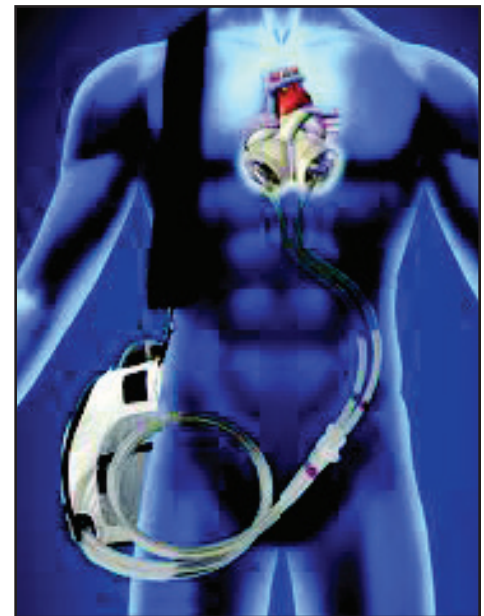
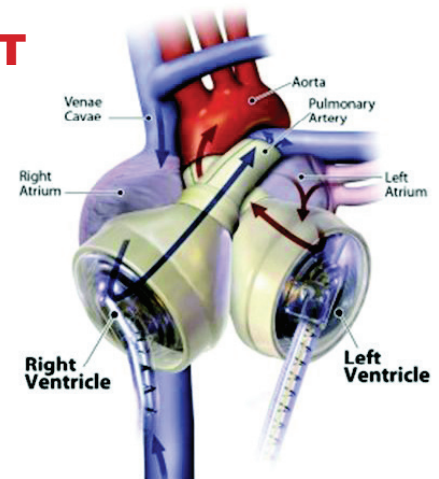
**The portability of the Total Artificial Heart (TAH) enables patients to resume many of their normal daily activities.**



# Total Artificial Heart Freedom™ Driver System

## This Patient is on an ARTIFICIAL HEART (not a left ventricular assist device-LVAD)

- Can I do external CPR?**  
No. Will need to rapidly exchange to the backup driver.
- Is there a “hand pump” or external backup device to use?**  
No.
- Can I give vasopressive IV drugs like epinephrine, dopamine or dobutamine?**  
Never give vasopressive drugs, especially epinephrine. These patients primarily have symptomatic hypertension and rarely have symptoms of hypotension. Most IV vasopressive drugs can be fatal to a TAH (Total Artificial Heart) patient.
- Can I speed up the rate of the device?**  
No. The device has a fixed rate between 120-140-BPM.
- What is the primary emergency intervention for a TAH (Total Artificial Heart)?**  
Nitroglycerin sublingual for symptomatic hypertension.
- Can the patient be defibrillated or externally paced while connected to the device?**  
No. There is no heart.
- What if the patient is symptomatic and the Freedom Driver is alarming with a continuous alarm and the red light ?**  
If the pump has failed or a line is disconnected or kinked, the patient may pass out within 30 seconds. Even when alarming, the device should continue to pump. When in doubt, immediately change out the Freedom™ Driver immediately. Then quickly check for loose or kinked connections.
- Does the patient have a pulse with this device?**  
Yes. The device produces Pulsatile flow. The device is pneumatically driven and is normally loud.
- What are acceptable vital sign parameters?**  
The BP will vary. Normal range 100-130 systolic and 60-90 diastolic.
- What kind of Cardiac rhythm should be displayed?**  
Asystole.

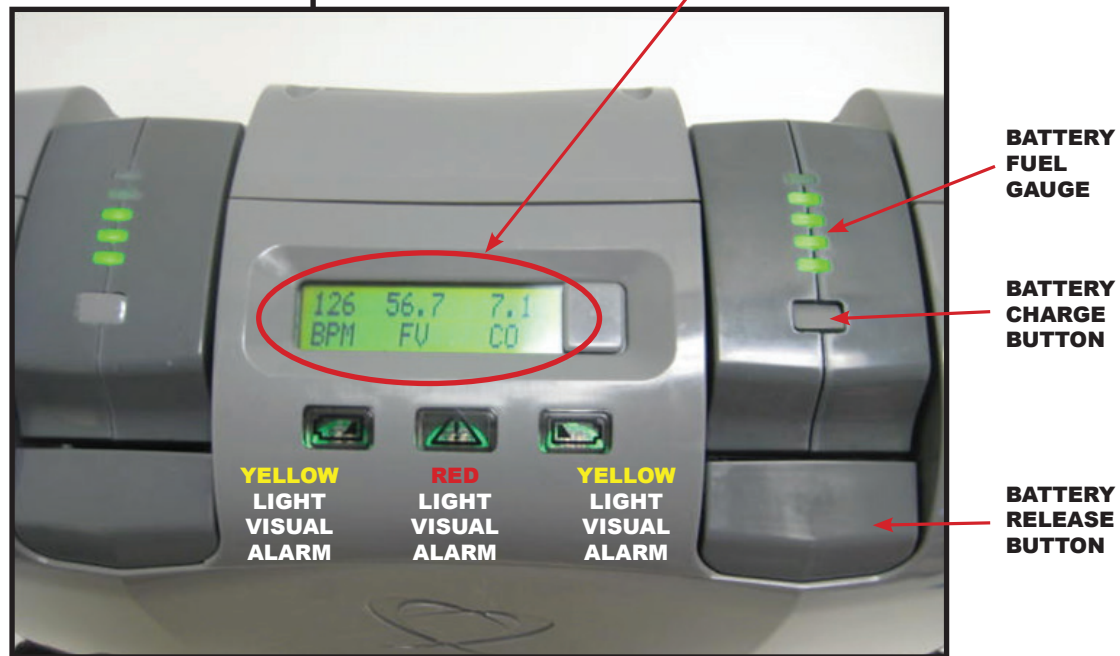
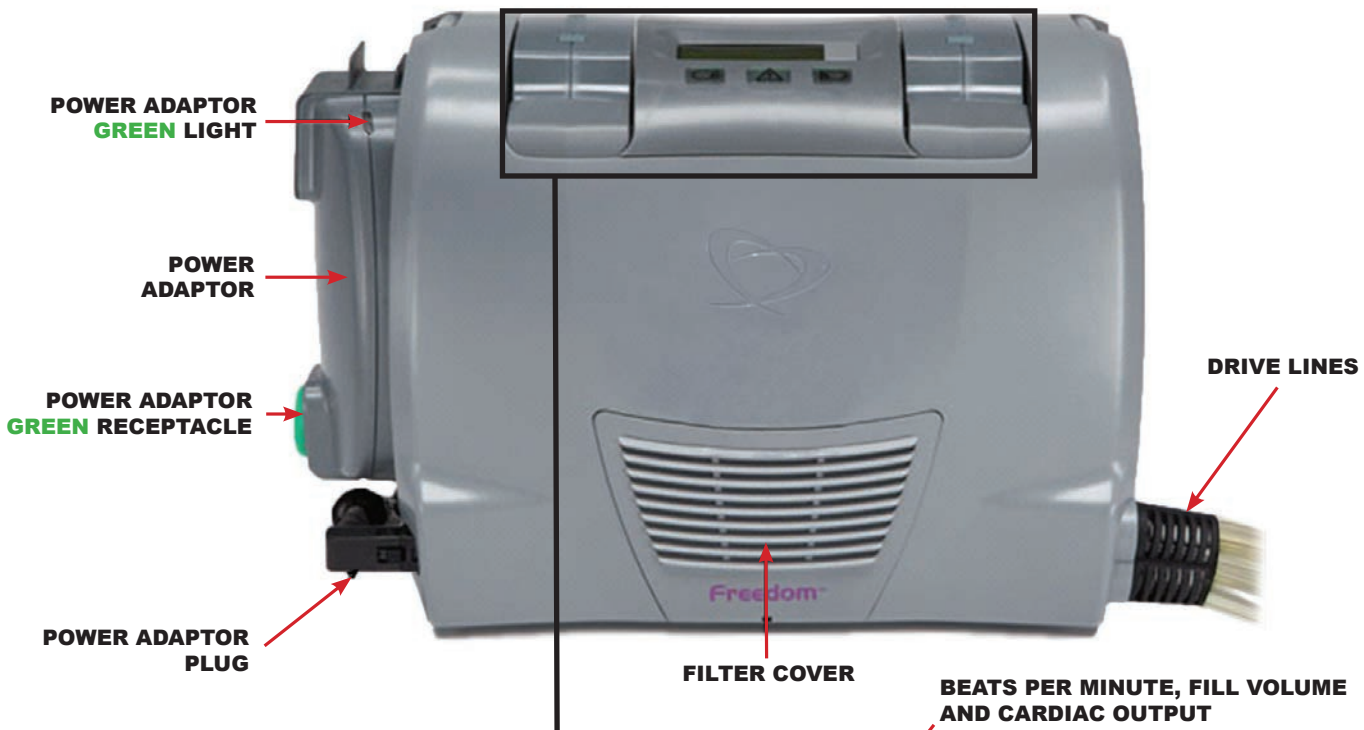


“Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport .ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010”



# Trouble Shooting Freedom™ Driver System

**This Patient is on an ARTIFICIAL HEART  
(not a left ventricular assist device -LVAD)**



## Freedom™ Driver System

### IN THE EVENT OF AN EMERGENCY

**Immediately notify VAD coordinator listed on the medical alert bracelet or tag attached to the console - please identify the device as a total artificial heart.**

"Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport .ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010"

# HOW TO RESPOND TO FREEDOM™ DRIVER ALARMS

**There is no way to mute an Alarm.**

ALARM	HEAR	SEE	MEANING	WHAT YOU SHOULD DO
Battery Alarm	Loud Intermittent Tone	Yellow Battery LED Flashing	One or both of the Onboard Batteries have less than 35% remaining charge (only two green lights display on the Battery Fuel Gauge).	Replace each low Onboard Battery, one at a time, with a charged Onboard Battery or connect to external power (NOTE: Once the batteries are charged above 35% the Battery Alarm will stop) .
			Onboard Battery is incorrectly installed.	Reinsert Onboard Battery until locked in place. If Battery Alarm continues, insert a new Onboard Battery.
			One Onboard Battery missing.	Insert charged Onboard Battery into Freedom™ Driver until locked in place.
Temperature Alarm	Loud Intermittent Tone	Red Alarm LED Flashing	The temperature of the Driver is too hot or too cold.	Remove any objects that are blocking the Filter Cover and/or Fan and check the filter.
			The internal temperature of the Driver is too hot.	Move the Freedom Driver to a cooler or warmer area.
Fault Alarm	Loud Continuous Tone	Red Alarm LED Solid	Valsalva Maneuver: Strenuous coughing or laughing, vomiting, straining during a bowel movement, or lifting a heavy weight.	Relax/interrupt Valsalva Maneuver.
			Kinked or disconnected drive lines.	Straighten or connect drive lines.
			Driver is connected to External Power without at least one correctly inserted Onboard Battery.	Insert a charged Onboard Battery into the Freedom™ Driver until locked into place.
			One or both of the Onboard Batteries have less than 30% remaining charge.	Replace each low Onboard Battery, one at a time, with a charged Onboard Battery or connect to external power. (NOTE: the Fault Alarm will continue and will change into a Battery Alarm as the Onboard Batteries recharge. Once the Onboard Batteries are charged above 35%, the Battery Alarm will stop.)
			Malfunction of the Driver	If the steps above do not stop the Fault Alarm, switch to Backup Freedom Driver. Return to implant hospital.
Temperature Alarm	Loud Intermittent Tone	Red Alarm LED Flashing	The internal temperature of the Driver is too hot.	Remove any objects that are blocking the Filter Cover and / or Fan and check filter.
			The temperature of the Onboard Batteries is too hot or too cold.	Move the Freedom Driver to a cooler or warmer area.

**You must immediately address the issue that caused the Alarm.**

"Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport .ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010"

JANUARY 2019

# Switching from Primary to Backup Freedom™ Driver

**CAUTION:** It is recommended to have TWO people exchange the primary Freedom Driver for the backup Freedom Driver. Make sure all items and accessories are closely available before attempting to exchange Drivers.

## Setting up the Backup Freedom™ Driver

1. Remove the drive line caps from the ends of the Drive lines.
2. Insert one charged Onboard Battery. The driver will immediately start pumping. (Figure 1)
3. Remove the Orange Dummy Battery. (Figure 1)
4. Insert the second charged Onboard Battery. (Figure 2)
5. If possible, connect the backup Driver into a wall power outlet.
6. Your Freedom™ Driver is now ready to connect to the patient.



**FIGURE 1**



**FIGURE 2**



**FIGURE 3**

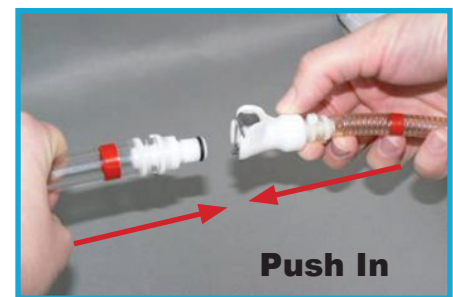
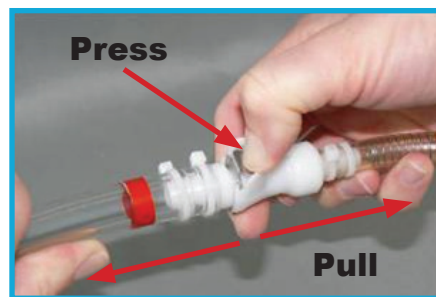
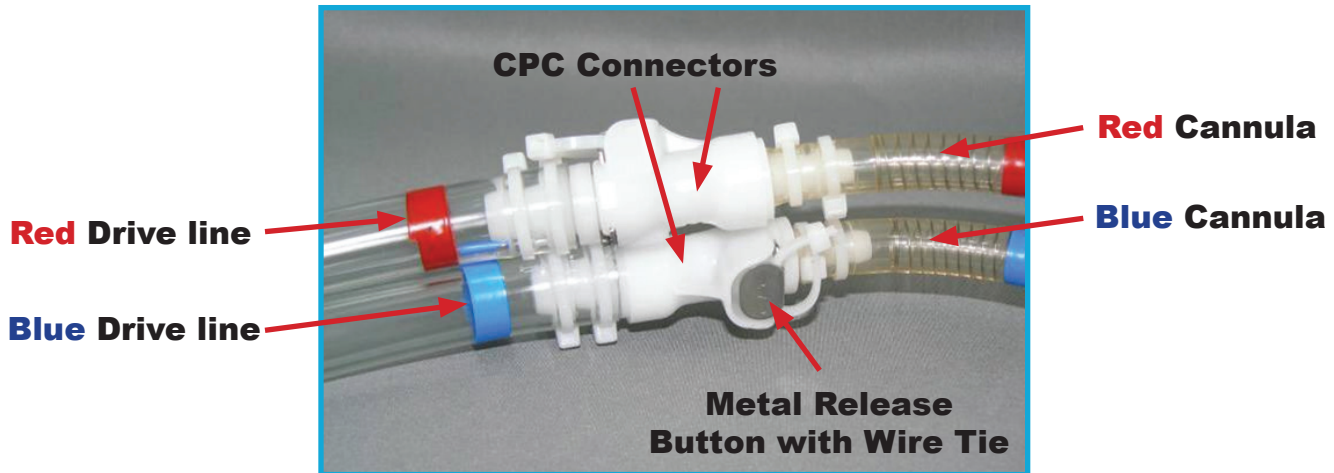
**BEATS PER MINUTE, FILL VOLUME AND CARDIAC OUTPUT**

*Continued on next page.*



# Switching from Primary to Backup Freedom™ Driver

Continued on from previous page



1. With the Wire Cutter Tool, cut the Wire Tie under the metal release button of the CPC Connector that secures the **RED** TAH-t Cannula to the **RED** Freedom Drive line. Gently pull to remove the Wire Tie and discard. **DO NOT DISCONNECT THE CANNULA FROM THE DRIVE LINE YET.**
2. With the Wire Cutter Tool, cut the Wire Tie under the metal release button of the CPC Connector that secures the **BLUE** TAH-t Cannula to the **BLUE** Freedom Drive line. Gently pull to remove the Wire Tie and discard. **DO NOT DISCONNECT THE CANNULA FROM THE DRIVE LINE YET.**

**CAUTION:** Before disconnecting the Drive lines of the primary Freedom Driver, you must have the Drive lines of the backup Freedom Driver within reach. The backup Driver must be turned on. Perform steps 3 and 4 simultaneously.

3. Disconnect the **RED** Cannula from the **RED** Drive line of the primary Freedom Driver:
  - Press and hold down the metal release button. Pull the **RED** Cannula away from the **RED** Drive line.
  - Immediately insert the **RED** Cannula into the new **RED** Drive line from the backup Freedom Drive. Insert until a click is heard and lightly tug on the connection to make sure that it is secure.
4. Simultaneously disconnect the **BLUE** Cannula from the **BLUE** Drive line of the primary Freedom Driver:
  - Press and hold down the metal release button. Pull the **BLUE** Cannula away from the **BLUE** Drive line.
  - Immediately insert the **BLUE** Cannula into the new **BLUE** Drive line from the backup Freedom Driver.
  - Insert until a click is heard and lightly tug on the connection to make sure that it is secure.
5. Slide a Wire Tie under the metal release button of each CPC connector. Create a loose loop in the tie, taking care not to depress and disconnect the connectors. Cut off the excess length of both Wire Ties.
6. Patient must notify Hospital Contact Person of the switch.
7. The Hospital should notify SynCardia Systems that the Driver has been switched and return the faulty Driver.

# EMS Guide

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## Jarvik 2000<sup>®</sup> VAS



This guide is produced by ICCAC – The International Consortium of Circulatory Assist Clinicians. The ICCAC is the professional society for MCS Clinicians throughout the world. It has been vetted by experts in MCS, Air Medical Transport, and Emergency Services. It should not replace the device operating manual as a primary source of information.

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# Questions and Answers Ventricular Assist Device

## What is a Ventricular Assist Device (VAD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.

## How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

## What are the parts of a VAD?

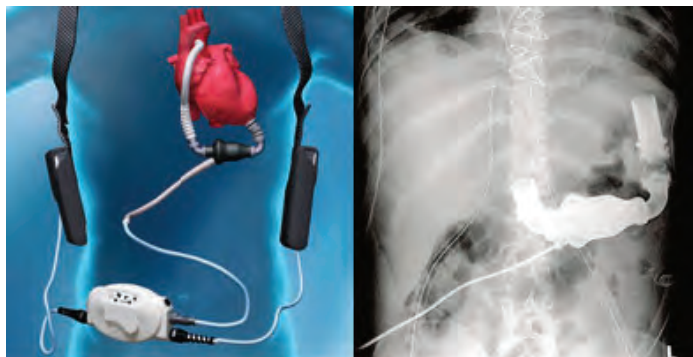
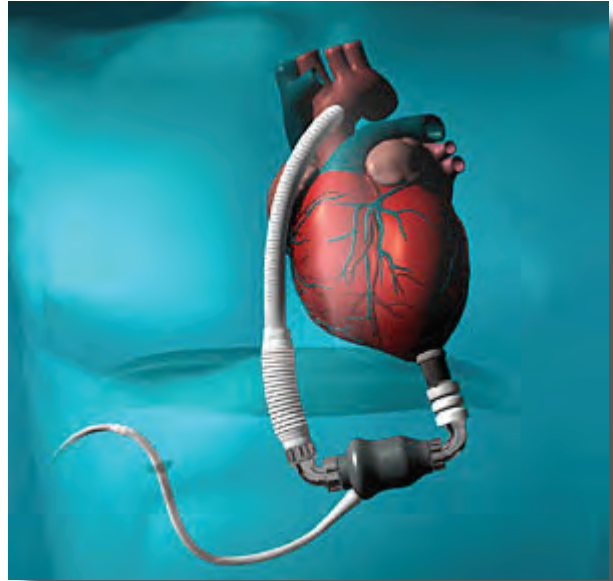
The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

## What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patients shoulders.

## What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.



The portability of the HeartMate II enables patients to resume many of their normal daily activities.

## Color Coding System

**MOST** patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are caring for.

**HEARTMATE III**

**HEARTMATE II**

**HEARTWARE**

**JARVIK 2000**

**FREEDOM DRIVER**  
Total Artificial Heart

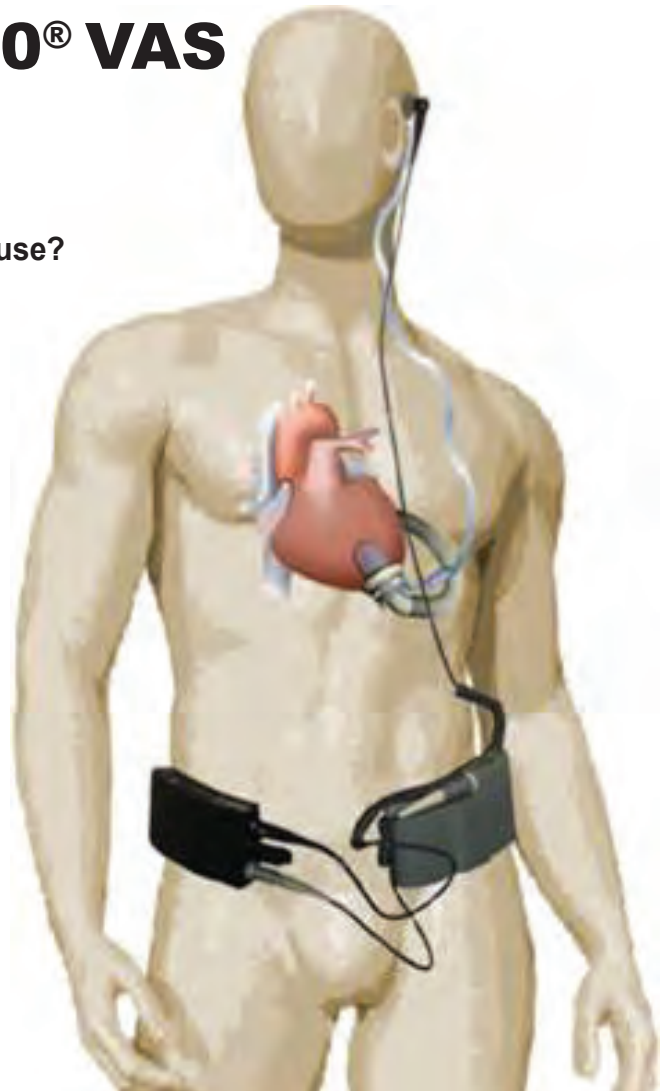


# Patient Management For VADs

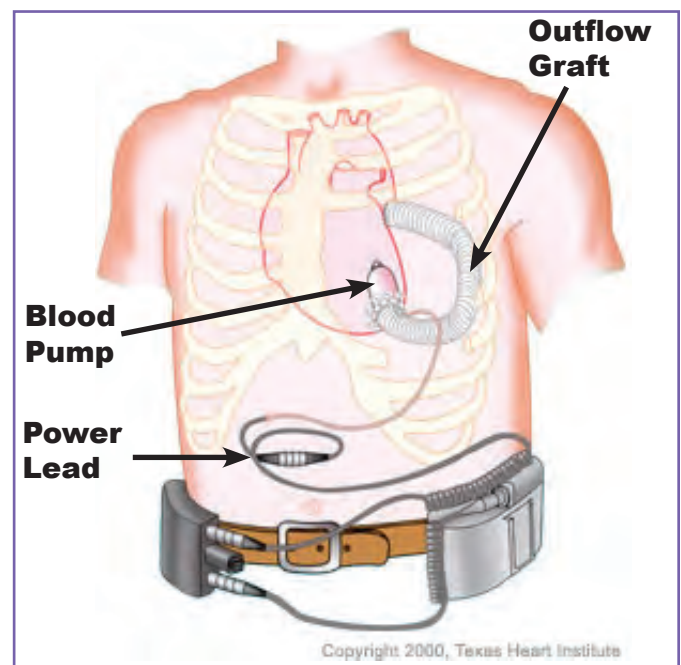
1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a “whirling sound”.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is.**
5. **Match the color on the device tag to the EMS Guide.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP).**
9. **If no Doppler, use the Mean on the non invasive blood pressure machine.**
10. **Transport to closest VAD center. Call the number on the device to get advice.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

# Jarvik 2000® VAS

- 1. Can I do external CPR?**  
Yes, only as a last resort.
- 2. If not, is there a “hand pump” or external device to use?**  
No.
- 3. If the device slows down (low flow state), what alarms will go off?**  
No alarm for low flow. If pump is off, the red “Pump Stop” symbol will light with a continuous alarm.
- 4. How can I speed up the rate of the device?**  
There is a speed dial on the side of the controller (see picture on next page). Turning the dial in the direction of the arrow increases the speed. Each increment is 1,000 RPM. It is recommended not to change the speed without consulting the implanting center.
- 5. Do I need to heparinize the patient if it slows down?**  
Typically yes, if the pump is stopped (red “Pump Stop” alarm). Check with the implanting center.
- 6. Can the patient be defibrillated while connected to the device?**  
Yes.
- 7. If the patient can be defibrillated, is there anything I have to disconnect before defibrillating?**  
No.
- 8. Does the patient have a pulse with this device?**  
Most patients have a faint palpable pulse. If the controller is marked “ILS” (see below), the speed is automatically reduced every minute for 8 seconds & the patients pulse may increase during this time.
- 9. What are acceptable vital sign parameters?**  
MAP 65 - 80mm Hg.
- 10. Can this patient be externally paced?**  
Yes.



**Jarvik 2000 with Post-Auricular exit site.**



**Jarvik 2000 with Abdominal exit site.**

*Adapted from Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport in ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010 in press. This guide does not supersede manufacturer instructions. Copy with permission only. March 2019 Jarvik 2000®*

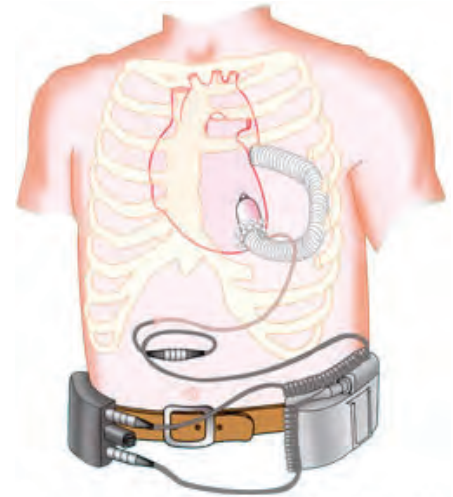
## Jarvik 2000® VAS



**Jarvik 2000® VAS,  
Post-Auricular Cable.**

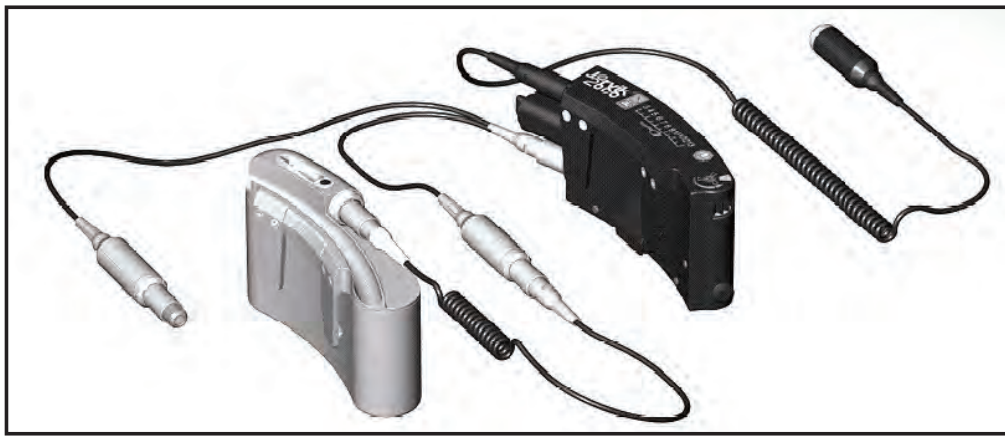


The Jarvik 2000® VAS is available in two models: the Jarvik 2000® VAS, Post-Auricular Cable (JHI-001) and the Jarvik 2000® VAS, Abdominal Cable (JHI-002). The main difference between the two models is the exit site of the drive cable. The drive cable of the Jarvik 2000® VAS, Abdominal Cable exits the abdomen and the drive cable of the Jarvik 2000® VAS, Post-Auricular Cable exits at a Pedestal surgically attached to the skull behind the ear.



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**Jarvik 2000® VAS,  
Abdominal Cable.**



**External Equipment for Jarvik 2000® VAS, Abdominal Cable.**



**External Equipment for Jarvik 2000® VAS, Post-Auricular Cable.**

NOTE: This Field Guide is NOT intended to replace the Operator Manual and Patient Handbook.

January 2019



# Jarvik 2000® VAS



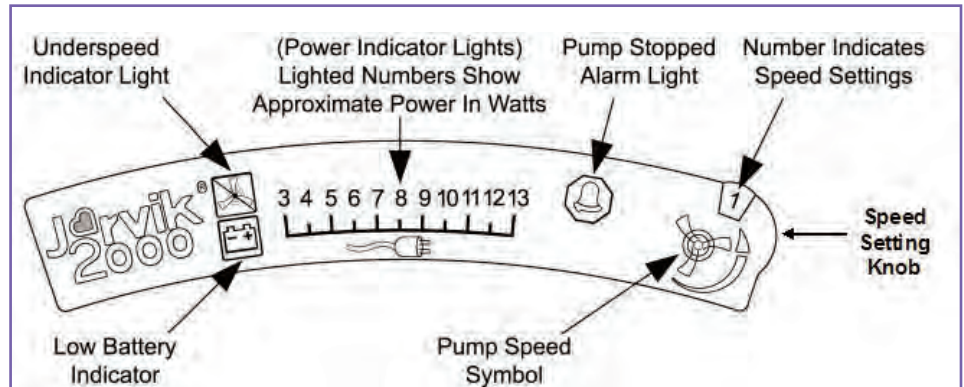
**Li-ion Battery.**



**Reserve Battery/Charger.**



**FlowMaker® Controller.**



**Diagram of FlowMaker® Controller Top Panel.**

Dial Setting	Speed Rpm	Flow L/min	Power Watts
1	8,000	1-2	3-4
2	9,000	2-3	4-5
3	10,000	4-5	5-6-7
4	11,000	5-7	7-8-9
5	12,000	7-8.5	8-9-10

### The FlowMaker Controller provides:

1. power to the implanted blood pump,
2. user settable speeds at which the pump runs, and
3. alarms and warnings.

The **FlowMaker®** Controller does not monitor the actual blood flow that the **Jarvik 2000® Ventricular Assist Device (VAD)** is pumping. In general, the higher the setting number the more blood the Jarvik 2000 VAD will pump. The tabulated flow estimates are based on research measurements in healthy animals. The actual blood flow may vary and will depend on several factors including blood pressure and the condition of the natural heart.

# Jarvik 2000® VAS

## Speed Setting, Alarms, and Warnings



Only one control adjustment to the **Jarvik 2000® VAD** can be made. The **Jarvik 2000® VAD speed** can be selected by turning the knob on the side of the **FlowMaker® Controller**. The setting number appears in the window on the top panel. The arrow indicates the direction to turn the knob to increase the speed.



**Power Indicator Lights** The numbers indicate the electrical power (Watts) that the VAD is using. One, two, or three numbers may be lit at any moment, and the lights may change rhythmically with the heartbeat of the natural heart. A power measure of 13 watts or more indicates malfunction. The High Power Indicator, number 13, will light yellow. This condition should receive prompt medical attention.



When the battery powering the **Jarvik 2000® VAD** is low, the **Low Battery Alarm** on the **FlowMaker® Controller lights yellow** and the alarm sound beeps. Remaining running time with the portable Li-ion Battery is about 5-10 minutes; with the Reserve Battery/Charger for approximately 15 minutes



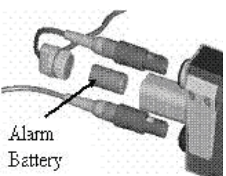
If the **Jarvik 2000® VAD** stops or if the VAD speed drops to below 5,000 RPM for any reason, a steady alarm sound is heard and the **Pump Stopped Alarm** on the **FlowMaker® Controller lights red**. The **Pump Stopped Alarm** will also sound if the intermittent low speed featured on the ILS FlowMaker® Controller fails to function for any reason. Immediate attention is required. **Follow the Pump Stopped Alarm procedure for the appropriate Jarvik 2000® VAS model (Post-Auricular Cable or Abdominal Cable) which is included in this Field Guide.**



The **Underspeed Indicator light will glow yellow** when the **Flowmaker® Controller** detects that the **Jarvik 2000® VAD** speed is slower than the dial setting selected. The most common reason is the battery voltage is too low.

**In this case, corrective actions are to:**

**1** Select a lower speed setting on the **Flowmaker® Controller** and/or **2** Change the battery to a fully charged Li-ion Battery. If the underspeed indicator light is still lit, then the cause may be a fault in the system. Replace all external components; and if the underspeed light is still on after replacing all external components, treat the situation as an emergency and seek immediate medical attention. *See Patient Handbook and Operator Manual for more details.*



A non-rechargeable **Alarm Battery** is used to assure that the **FlowMaker Controller** has enough power for the alarms if the main battery fails, if the battery cable fails, or if the main battery becomes accidentally disconnected.

This **Alarm Battery** is located in a small housing on the end of the **FlowMaker® Controller** between the connectors for the cables. Be sure that the **Alarm Battery Cap** holding the Alarm Battery in place on the **FlowMaker® Controller** is screwed on finger tight whenever the **FlowMaker® Controller** is used. If the **Alarm Battery Cap** is not screwed finger tight in place, the backup power for the alarms will not function. Every time the **Alarm Battery Cap** is tightened, the Controller's back-up Alarm needs to be tested. With a caregiver present, briefly disconnect the main battery (Li-ion Battery or Reserve Battery/Charger) to be sure the Pump Stopped Alarm sounds. The disconnection should be brief and the main battery should be reconnected almost immediately. If the Pump Stopped Alarm does not sound, retighten the Alarm Battery Cap and repeat the test.

Contact the implant center immediately if the alarm does not sound during this test.



# Jarvik 2000® VAS

## Procedure to Resolve Pump Stopped Alarm Jarvik 2000® VAS, Post-Auricular Cable

The most likely reason for the Jarvik® 2000 VAD (pump) to stop is a completely **discharged battery** or a **disconnected** or **damaged cable**. If the cause of a component failure is clearly identifiable (i.e. low battery, physical damage, etc.) replace that cable or component **first**.

If the cause is unknown, follow these step-by-step instructions with the assistance of a support person. The patient should sit down or lie down. This procedure should be completed quickly. Back-up equipment must be immediately available.

1. Be sure the alarm is not an intermittent beeping which only indicates a low battery. If the alarm is beeping, change the battery as usual.
2. If the Jarvik 2000® VAD is stopped (steady alarm sounding, red light on):
  - a. **Disconnect the Pedestal Cable from the Pedestal at the skull, and set aside all the attached components.** Disconnect the Li-ion Battery Cable and also partially unscrew the Alarm Battery Cap on the FlowMaker® Controller to silence the alarm.
  - b. Plug in a backup Pedestal Cable into the Pedestal and into a backup FlowMaker® Controller. Make sure the FlowMaker® Controller is set at speed setting 1. Make sure to tighten the Alarm Battery Cap on the backup FlowMaker® Controller to activate the alarm.
  - c. Using the backup Li-ion Battery Cable, plug a fully charged Li-ion Battery into the FlowMaker® Controller.
  - d. If the Jarvik 2000® VAD now runs, and the patient is feeling well, red tag the original components that were set aside in step 2a.
  - e. Set the FlowMaker® Controller back at the speed the user was using prior to the alarm.
3. **If the Jarvik 2000 VAD (pump) is still stopped call the medical emergency number immediately.**
4. Red tag all components of the system that were set aside before changing to the backup components in step 2a. This should be done with the assistance of a medical support person if possible.
5. It is possible that one of the connectors is not fully plugged in and is not making contact. Recheck all connectors.
6. If the Jarvik 2000® VAD still has not started, the patient should lie down and the support person should double check batteries and connectors. Try changing batteries again. It is possible that a discharged battery was removed and the same discharged battery was accidentally plugged back into the system. It is possible that neither battery is charged. If no lights illuminate on either battery, use a third battery. It is also possible that one of the connectors is not fully plugged in and is not making contact. Recheck all connectors.
7. If all of the above steps have been followed and all cables and components have been replaced without successfully restarting the Jarvik 2000® VAD, **disconnect the power to the Jarvik 2000® VAD by unplugging the battery.** Also partially unscrew the Alarm Battery Cap on the FlowMaker® Controller. **(The alarm should stop sounding).** If the Li-ion Battery or Reserve Battery/Charger is not disconnected, the FlowMaker® Controller will apply power to the Jarvik 2000® VAD which could be harmful. Disconnecting the battery reduces the chance of a clot forming inside the Jarvik 2000® VAD by allowing the rotor to spin as blood flows across it.

**Note: Return any failed or suspect component(s) to your Clinical Center for evaluation by Jarvik Heart, Inc.**





# Jarvik 2000® VAS

## Procedure to Resolve Pump Stopped Alarm Jarvik 2000® VAS, Abdominal Cable

The most likely reason for the Jarvik 2000® VAD (pump) to stop is a completely **discharged battery** or a **disconnected** or **damaged cable**. If the cause of a component failure is clearly identifiable (i.e. low battery, physical damage, etc.) replace that cable or component **first**.

If the cause is unknown, follow these step-by-step instructions with the assistance of a support person. The patient should sit down or lie down. This procedure should be completed quickly. Back-up equipment must be immediately available.

1. Be sure the alarm is not an intermittent beeping which only indicates a low battery. If the alarm is beeping, change the battery as usual.
2. If the Jarvik 2000® VAD is stopped (steady alarm sounding, red light on):
  - a. **Disconnect the Extension Cable from the drive cable at the abdomen, and set aside all the attached components.** Disconnect the Li-ion Battery Cable and also partially unscrew the Alarm Battery Cap on the FlowMaker® Controller to silence the alarm.
  - b. Plug the drive cable (the cable exiting the skin at the abdomen) directly into the backup FlowMaker® Controller (eliminating the Extension Cable). Make sure the FlowMaker® Controller is set at speed setting 1. Make sure to tighten the Alarm Battery Cap on the backup FlowMaker® Controller to activate the alarm.
  - c. Using the backup Li-ion Battery Cable, plug a fully charged Li-ion Battery into the FlowMaker® Controller.
  - d. If the Jarvik 2000® VAD now runs and the patient is feeling well, red tag the original components that were set aside in step 2a.
  - e. Set the FlowMaker® Controller back at the speed the user was using prior to the alarm.
3. **If the Jarvik 2000® VAD (pump) is still stopped call your medical emergency number immediately.**
4. Red tag all components of the system that were set aside before changing to the backup components in step 2a.
5. Be sure that all external cables and connectors have been changed and check to see if the connector at the end of the drive cable exiting the skin at the abdomen is broken. If it is broken and has come apart – try to put it back together where it is broken. If the Jarvik 2000® VAD does not run, take the connector apart again – rotate the parts 90° and put the connector back together again. Repeat three times. The Jarvik 2000 VAD may start. The connector may then be held together with tape while the patient is transported to the hospital for it to be repaired.
6. It is possible that one of the connectors is not fully plugged in and is not making contact. Recheck all connectors.
7. If the Jarvik 2000® VAD still has not started, the patient should lie down and the support person should double check batteries and connectors. Try changing batteries again. It is possible that a discharged battery was removed and the same discharged battery was accidentally plugged back into the system. It is possible that neither battery is charged. If no lights illuminate on either battery, use a third battery. It is also possible that one of the connectors is not fully plugged in and is not making contact. Recheck all connectors.
8. If all of the above steps have been followed and all cables and components have been replaced without successfully restarting the Jarvik 2000® VAD, **disconnect the power to the Jarvik 2000 VAD by unplugging the battery.** Also partially unscrew the Alarm Battery Cap on the FlowMaker® Controller. **(The alarm should stop sounding).** If the Li-ion Battery or Reserve Battery/Charger is not disconnected, the FlowMaker® Controller will apply power to the Jarvik 2000® VAD which could be harmful. Disconnecting the battery reduces the chance of a clot forming inside the Jarvik 2000® VAD by allowing the rotor to spin as blood flows across it.

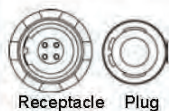
**Note: Return any failed or suspect component(s) to your Clinical Center for evaluation by Jarvik Heart, Inc.**





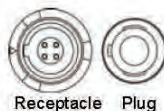
# Jarvik® 2000

## Jarvik 2000® Adult Ventricular Assist System—Quick Reference Guide



Receptacle Plug

**Connection from Jarvik 2000 VAD to FlowMaker Controller:** The black receptacle on the FlowMaker Controller is located above the housing for the small back-up Alarm Battery. The receptacle has double key slots for a black plug. The Extension Cable and the Pedestal Cable (depending on the model of the device used) also have double key slots.



Receptacle Plug

**Connection from FlowMaker Controller to Y Cable or battery:** The gray receptacle on the FlowMaker Controller is located below the housing for the small back-up Alarm Battery. This receptacle has a single key slot for the gray plug of the Y Cable, Li-ion Battery Cable, and Reserve Battery/Charger.



Note that the single and double keys on the plugs and receptacles are easily visible and must be placed in the proper rotational position, with the arrows on receptacle and plug lined up, for the connectors to go together. The connectors are attached and removed by a push-pull latch mechanism, not by a screw thread. Place the plug into the receptacle with slight pressure and gently rotate the plug until the key-way engages. Then push the connector together. The connector should click into place and should not come apart if the cable is tugged. To remove the plug, hold it close to the receptacle and pull.

- Never attempt to disconnect any connector by twisting.
- Do not attempt to pull the connector apart by the wire or by the strain relief.
- Never force a connector together. If the plug does not go into the receptacle easily, gently rotate it until it is aligned properly. When it is fully engaged, a soft click can be heard.
- If a connector is damaged or pins are bent, do not attempt to repair but replace the cable instead.

The **Y Cable** for the Jarvik 2000 VAS is used to allow battery changes without removing power from the Jarvik 2000 VAD. Before unplugging a discharged battery, a recharged battery should be plugged into the Y Cable. If the battery cable is unplugged prior to attaching a charged battery to the other end of the Y Cable, the Jarvik 2000 VAD stops, but the natural heart continues to beat. If this occurs, the beeping tone of the alarm will change to a steady tone, indicating that the Jarvik 2000 VAD is stopped. After the used battery is replaced with a fresh one, always remove the discharged battery from the Y Cable.



The portable **Li-ion Battery** will run the Jarvik 2000 VAS for 7-12 hours under usual conditions. The Li-ion Battery has an indicator with 5 lights that indicates how much power is remaining. Depress the black button to turn on the indicator lights:

Indicator	Approximate Remaining Time
All 5 LEDs lit	8-12 hours
4 LEDs lit	6-10 hours
3 LEDs lit	5-8 hours
2 LEDs lit	3-5 hours
1 LED lit	5 minutes - 2 hours

### Li-ion Battery Charger

When the Li-ion Battery Charger is first connected to wall power, the green light next to the vertical green bar will turn on. The second light will simultaneously turn on green for approximately 1-3 seconds, followed by the startup sequence below:

- Flashing yellow for approximately 18-24 seconds
- Solid green for approximately 1-3 seconds
- Off

The Li-ion Battery Charger is not required to go through the startup sequence each time it is connected to a Li-ion Battery. It will only occur when wall power is first applied to the Li-ion Battery Charger.

Never connect the Li-ion Battery to the Li-ion Battery Charger while the second light is green. If a connection is made during this brief period of time, the Li-ion Battery will not charge.

When disconnecting the Li-ion Battery Charger from a fully charged Li-ion Battery, always wait for the second light to turn off before connecting another Li-ion Battery.

The **Reserve Battery/Charger** has both a battery and a charger built into a single unit; however, they are not electrically connected to each other.

### Reserve Battery Use:

1. Unplug the gray cable from the battery charger and plug it into the gray connector of the Y cable or the FlowMaker Controller.
2. Unplug the black power cord from the Reserve Battery/Charger and the wall plug.
3. If the Reserve Battery/Charger is used for under 12 hours and then recharged, it will last for more than 1000 recharge cycles. If it is not recharged until it is fully discharged (>24 hrs capacity) and the low battery alarm sounds, it will last for fewer than 200 recharge cycles.
4. Use the Reserve Battery/Charger for less than 12 hours each night and recharge it each morning after switching to the Li-ion Battery.



Reserve Battery Use



Charging the Reserve Battery

### Charging the Reserve Battery:

Disconnect the gray plug from the Y Cable or FlowMaker Controller and plug it into the gray receptacle on the Reserve Battery/Charger.

A yellow light next to the Charge label on the Reserve Battery/Charger will turn on to indicate charging. When the Reserve Battery/Charger is near fully charged, the yellow light will turn off and automatically start to safely slow charge the battery. Continue charging the battery after the yellow light goes out and whenever the battery is not in use.

The green light next to the Power label on the Reserve Battery only indicates that wall power is connected to the charger section of the unit. The green light does not indicate the Reserve Battery/Charger is fully charged.

The Reserve Battery/Charger is near fully charged only when the Charge light turns off and the gray cable is plugged into the gray receptacle on the unit.

If the gray cable is not plugged into the receptacle on the Reserve Battery/Charger while the unit is also plugged into the wall, the Reserve Battery/Charger will not charge.

It is not possible to run the Jarvik 2000 VAS from wall power even if the Reserve Battery/Charger is plugged into wall power. It is also not possible to charge the Reserve Battery/Charger while the same Reserve Battery/Charger is being used to run the Jarvik 2000 VAD. At all times, the Jarvik 2000 VAD is run only from battery power.